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THE NATIONAL GEOGRAPHIC MAGAZINE

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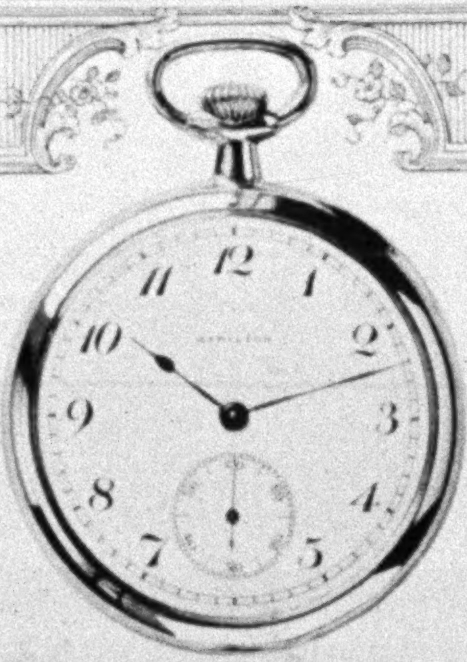

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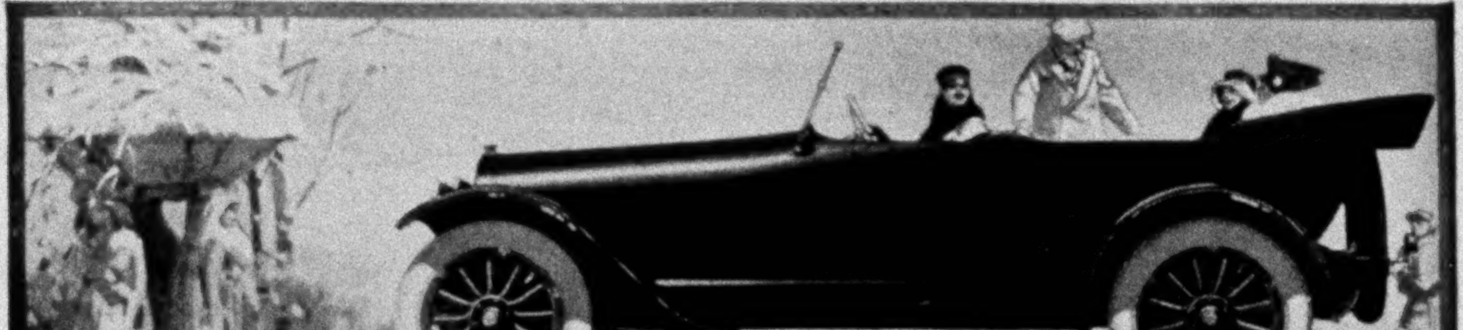

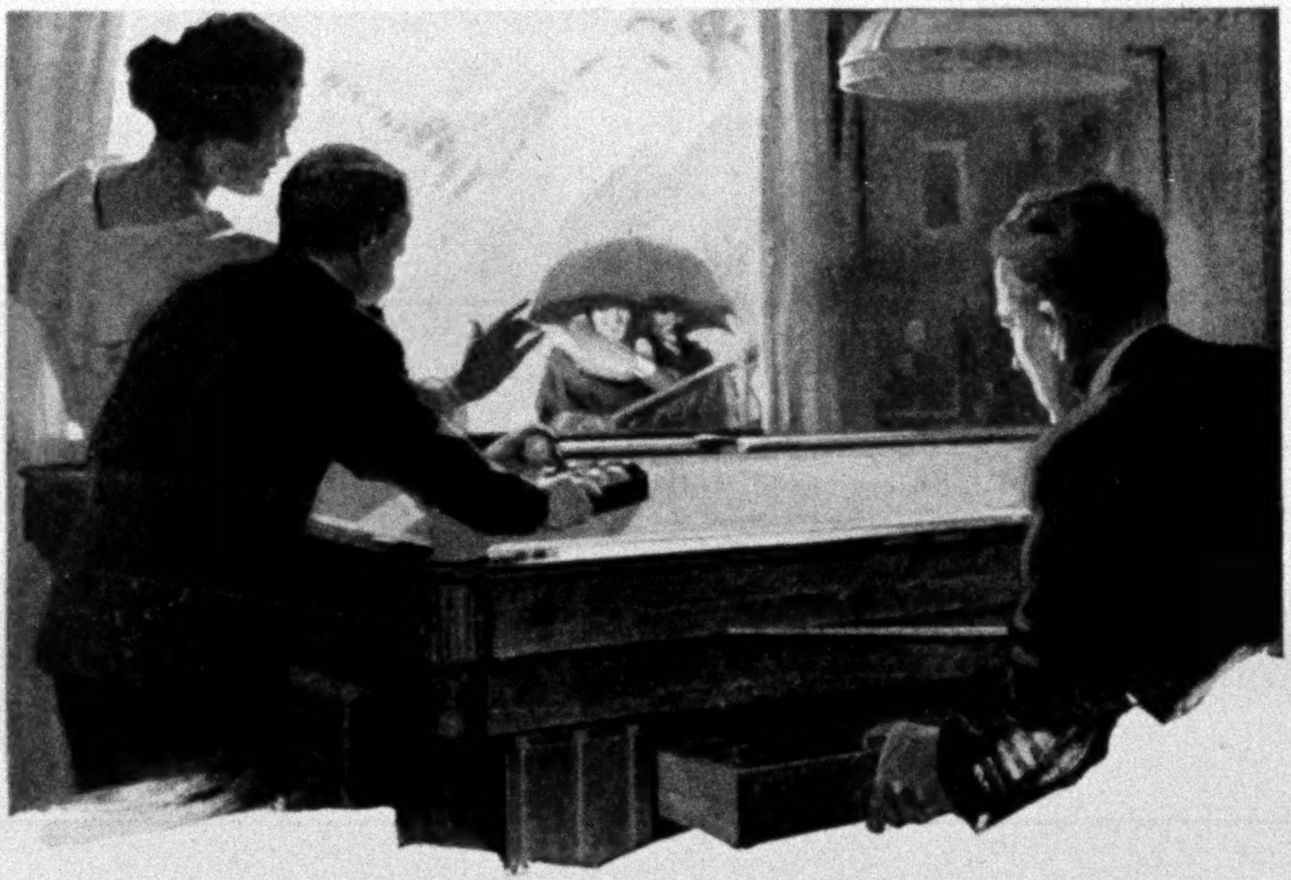

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And Any Home Has Room For a BRUNSWICK Table

Carom and Pocket Billiards are a captivating sport, and nowadays the Brunswick Home Table is the family playground. *When school lets out it quickens home-bound footsteps.*

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Get full information and color-pictures of tables in our latest catalog—Billiards—"The Home Magnet." The coupon brings a copy free by return mail. Send today.

No Other Six Resembles Hudson Super-Six

Don't Be Misled—It is a Hudson Invention

Sixes have come into renewed popularity since the Super-Six won the top place. But the Super-Six invention—controlled by our patents—added 80 per cent to the six-type efficiency. And that 80 per cent is what gave it supremacy, when the V-types threatened to displace the Six.

Late in 1915, remember, the Six was a waning type. Even the Light Six, which Hudson gave first rank, had revealed some vital engineering limitations.

It had not solved the problem of motor vibration. It had not minimized friction and wear. Its endurance had proved disappointing.

Sixes at that time held hardly a single record. They were mostly held by Fours.

And leading engineers, including the Hudson, were seeking a remedy in Eights and Twelves. At that time the Six, for high-grade cars, seemed verging on diplacement.

What Saved the Day

It was the Super-Six invention, remember, which then saved the day for the Six.

Hudson engineers discovered the shortcoming. By a basic invention they corrected the fault. They ended nearly all the vibration. They doubled the motor's endurance. Thus they created a motor which has since won all the worth-while records.

But that doesn't mean that the old-type Six is any better than it was.

'Twas the Super-Six That Won

The Super-Six, in a hundred tests, has outperformed all other motor types. It has not merely broken records. It has made new records which, a year ago, no man considered possible.

It broke the 24-hour endurance record by 52 per cent. It broke the transcontinental record twice in one round trip. A Super-Six touring car went from San Francisco to New York and back in 10 days and 21 hours.

It beat twenty famous rivals up Pike's Peak. It broke all stock-car speed records, and all for quick acceleration.

Then, after 7,000 record-breaking miles, it showed itself in new condition. Not a part or bearing showed evidence of wear.

No other motor ever built has shown anywhere near such endurance.

All By Saving Waste

The Super-Six develops no more power than other like-size motors. It simply delivers more. It almost eliminates motor friction and wear by ending nearly all the vibration.

That vibration, which wasted power, was the great fault of the Six. It is that which led to the Eight and Twelve as a possible solution. Any motor in which that fault remains can't compare with the Super-Six.

A New Gasoline Saver

The Hudson Super-Six, in endurance and performance, stands foremost in the world. The new style bodies which we have created make the car look its supremacy. A new exclusive feature—a gasoline saver—gives it this year another advantage.

It now outsells any other front-rank car. It has 25,000 enthusiastic owners, who know that no rival can match them.

You can prove in one hour, at any Hudson showroom, that this car deserves its place. And that no other car, at any price, can be classed with it. Do that before the spring demand overwhelms us.

Phaeton, 7-passenger	$1650	Touring Sedan	$2175	Town Car	$2925
Roadster, 2-passenger	1650	Limousine	2925	Town Car Landaulet	3025
Cabriolet, 3-passenger	1950	*(All Prices f. o. b. Detroit)*		Limousine Landaulet	3025

HUDSON MOTOR CAR COMPANY, DETROIT, MICHIGAN

Good Value-Always Growing Greater

As the improvements are made in Dodge Brothers car nothing is said to Dodge Brothers dealers, or to the public, about them.

This is in pursuance of a policy inaugurated by Dodge Brothers at the very outset.

They look upon the progressive improvement of the car as a matter of course.

It is a plain duty they owe to themselves and to the public.

There is no necessity of heralding these improvements in advance.

The public finds out about them in due time, and expresses appreciation and approval.

And so, while the process of betterment goes on every day, nothing is said of it until after it is accomplished.

The car is basically the same car as it was two years ago.

Yet there isn't a bit of doubt but that it is a better car.

The car of today is worth more money than the car of two years ago.

The price is the same, but the car is a better car.

Not because the costs of materials have increased—although they have. But especially because the standards of construction have been steadily raised—the shop practice made steadily finer.

And still, the buyers of the first cars, and every subsequent car, received full value.

That is proven by the fact that all of the cars, no matter how long ago they were built, are giving good service today.

It is still further proven by the high price they command when sold at second hand.

Any car built by Dodge Brothers commands a high price—whether it was built twenty-two months, or twelve months, or two months ago.

This high valuation on any car bearing Dodge Brothers' name has been fixed, not by them, but by the public.

Dodge Brothers have had few market problems to bother them, and practically nothing to do but make the car better.

They are their own severest critics, and they will never wait for the public to ask for a better car from them.

They try to anticipate—to travel ahead—to give even more than is expected.

No material, no part, and no accessory is barred from Dodge Brothers car because it is too high priced.

The only question asked, the only proof demanded, is of its goodness.

When the car was designed, its parts were charted and chosen according to quality, and with a total disregard of price.

That policy still prevails, only it has been intensified.

No source of supply can have too high a standard for Dodge Brothers—nothing too good can be offered for Dodge Brothers car.

That policy, plus a process of research, test, refinement and proof, make for continuous progress.

That is why it is still the same car, and yet a much finer car.

That is why it is worth more money than ever, though still sold at the same price.

That is why its value is always growing greater.

Touring Car or Roadster, $785. In Canada, $1100
Winter Touring Car or Roadster, $950. In Canada, $1335
Sedan, $1185. In Canada, $1685
All prices f. o. b. Detroit

DODGE BROTHERS, DETROIT

The Hours We Don't Forget

The Same Good-Nights for a Hundred Years Will be Said Over Dishes of Puffed Grains

The little ones in countless homes will tonight float Puffed Grains in their bowls of milk—

Puffed Wheat, Puffed Rice or Corn Puffs.

In times to come, their children's children will do the same, no doubt. For no man can ever make from wheat, rice or corn a better food than these.

The Pinnacle Foods Forever

Hundreds of foods have been made from these grains. But Puffed Grains mark the apex. They can never be excelled.

Prof. Anderson's process takes whole wheat or rice and makes every atom digestible. Every food cell is exploded. Every granule is fitted to feed. No one can ever go further.

These grains are sealed in guns. For an hour they are rolled in 550 degrees of heat. The moisture in each food cell is changed to steam. The guns are shot and that steam explodes.

There occur in each grain a hundred million explosions—one for every food cell. The grains are puffed to eight times normal size. They come out airy, flaky bubbles, as you see.

No other cooking process breaks more than half of the food cells. None can ever break more. So these must forever remain the sovereign foods produced from wheat, rice or corn.

Puffed Wheat **Puffed Rice**

and Corn Puffs

Each 15c Except in Far West

These are not mere morning dainties. They are all-day foods. Folks use them like nuts in candy-making, or as garnish for ice cream. They serve them as wafers in soup. Between meals they eat them dry. And no other morsels are so ideal for serving in bowls of milk.

Serve a different one each day.

The Quaker Oats Company

Sole Makers

(1452)

?
MILES
TO THE
GALLON

Higher Mileage

from both oil and gasoline follows lubricating efficiency

THE careful motorist today wants high mileage from his lubricating oil. For high mileage is significant in many ways.

Higher mileage from an oil means more work, less waste.

Higher mileage results from a more complete piston-ring seal. That means practically eliminating oil working into the combustion chambers. It means cutting down the gasoline waste past the piston rings. It means sealing-in the power, which then acts with full force on the pistons.

And a higher mileage oil must naturally be one which withstands the intense working-heat in the cylinders.

The high mileage from Gargoyle Mobiloils is causing a marked reduction in many annual oil bills. But, much more important, it points plainly to greater lubricating efficiency.

A Massachusetts garage man writes us: "Some motorists say Gargoyle Mobiloils go ⅓ to ½ further. In our seven livery cars we get 20 to 25 miles more per quart than with anything else on the job."

A prominent manufacturer of motor trucks and tractors found that Gargoyle Mobiloils cut *gasoline* consumption 28% when compared with one oil and 41% when compared with another.

We constantly hear of such experiences.

Frequently two friends own the same make and model of car.

Both are satisfied with gas and oil mileage until they compare results. Then comes a surprise to one of them.

We recommend that you compare results on your own car, as follows:

An Economical Demonstration

It will probably cost you less than $1.00 to fill your reservoir with the grade of Gargoyle Mobiloils specified for your car. The garage or dealer you trade with has it, or can promptly secure it for you.

Ask him to empty your reservoir of its present oil and fill it with the correct grade of Gargoyle Mobiloils. You can then judge for yourself the results in gasoline economy and reduced oil consumption, to say nothing of reduced carbon deposit. If your car is not listed in the partial chart to the right, a copy of our "Correct Lubrication" booklet containing the complete Chart will be sent you on request.

GARGOYLE

Mobiloils

A grade for each type of motor

The four grades of Gargoyle Mobiloils for gasoline motor lubrication, purified to remove free carbon, are:

Gargoyle Mobiloil "A"
Gargoyle Mobiloil "B"
Gargoyle Mobiloil "E"
Gargoyle Mobiloil "Arctic"

Electric Vehicles—For motor bearings and enclosed chains use Gargoyle Mobiloil "A" the year 'round. For open chains and differential use Gargoyle Mobiloil "C" the year 'round. ***Exception***—For ***winter lubrication*** of pleasure cars use Gargoyle Mobiloil "Arctic" for worm drive and Gargoyle Mobiloil "A" for bevel gear drive.

In buying Gargoyle Mobiloils from your dealer, it is safest to purchase in original packages. Look for the red Gargoyle on the container. For information, kindly address any inquiry to our nearest office.

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Rochester, N. Y., U. S. A.

Specialists in the manufacture of high grade lubricants for every class of machinery. Obtainable everywhere in the world.

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Correct Automobile Lubrication

Explanation: In the Chart below, the letter opposite the car indicates the grade of Gargoyle Mobiloils that should be used. For example, "A" means Gargoyle Mobiloil "A," "Arc" means Gargoyle Mobiloil "Arctic," etc. The recommendations cover all models of both pleasure and commercial vehicles unless otherwise noted.

EXAMPLE NO. 3

"Pecky" Cypress Used as Interior Trim!

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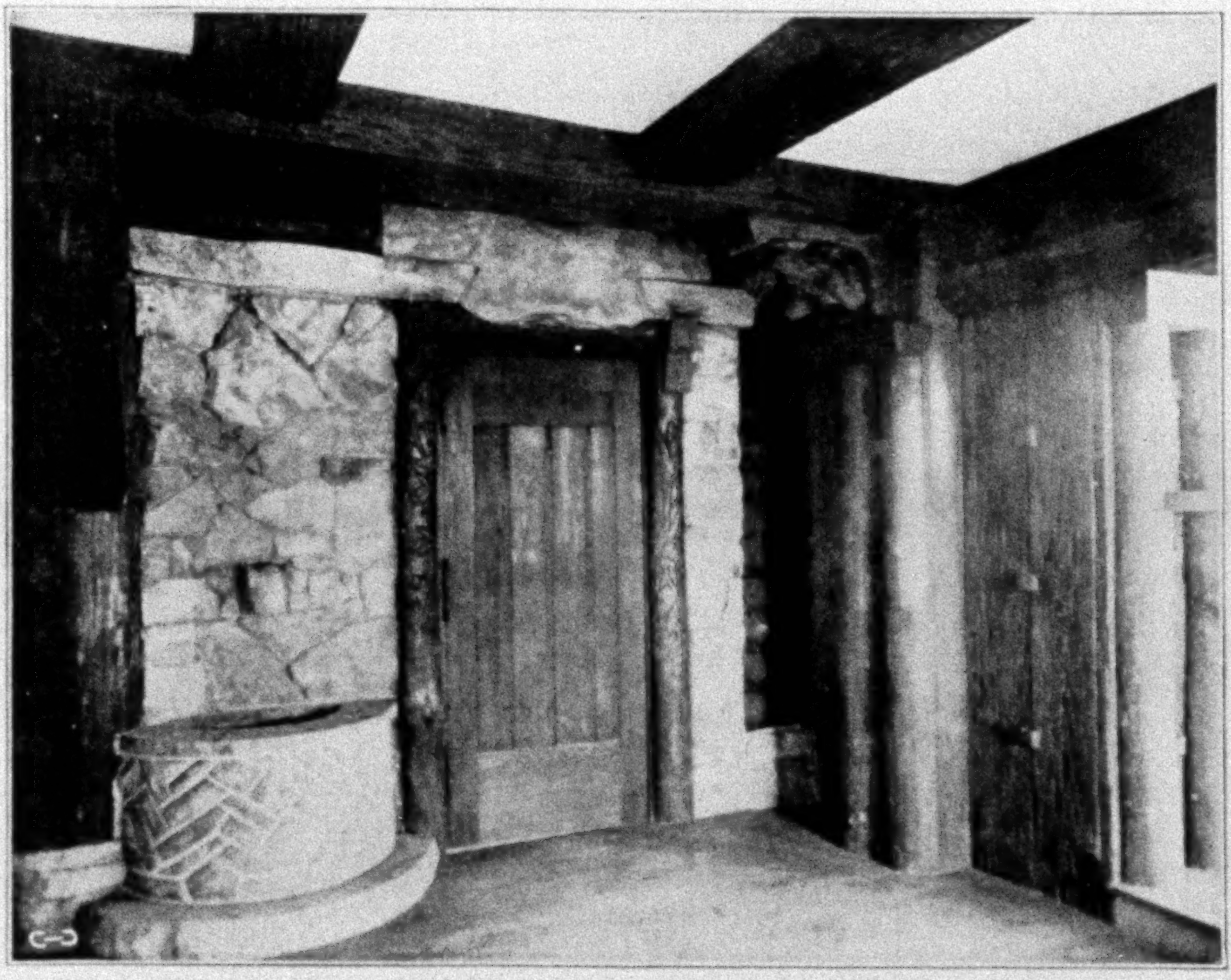

ANOTHER CORNER IN THE "FIELD" ROOM: ESTATE OF HENRY FORD, ESQ., DEARBORN, MICHIGAN. MR. W. H. VAN TINE, ARCHITECT, DETROIT.

Remarkably skillful artistic use of the LOWEST GRADE of Cypress, "the Wood Eternal" is shown above. The architect deliberately sought the parts of the Cypress logs which retain the visible evidence of ATTACKS BY ROT-GERMS and their COMPLETE DEFEAT. This is the confirmation, to the most cynical, of the longevity of Cypress. Mr. Van Tine writes as follows:

"April 19, 1916.—My object in using Cypress is the fact that I get better quality of wood for many purposes than other kinds and grades of lumber. The object of this room (the one shown above) was to produce an old, quaint effect . . . . The selection of the worm-eaten and old wood ("Pecky") has taken on a very important factor in the room. I have found Cypress a very satisfactory material and RELIABLE for OUTSIDE and INSIDE work, and take pleasure in making this statement." *(Signed)* W. H. VAN TINE.

JUST WRITE FOR VOL. 2—IT'S A FASCINATOR AS WELL AS A MONEY-SAVER.

("Pecky" Cypress is the LOWEST GRADE of Cypress, "the Wood Eternal"—but it's fine for what it's good for.)

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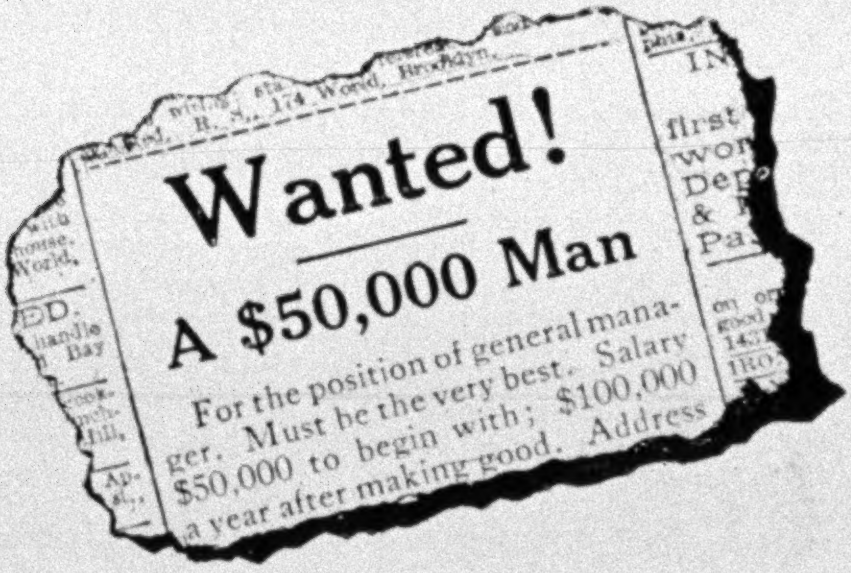

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A $50,000 Man

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Wanted-A $50,000 Man

THE response to this advertisement, run by a big Boston corporation, was enormous. Hundreds of applicants presented themselves, but one by one they were turned down. Their training and knowledge of business principles were not broad enough to fit them for the position. What was wanted was a man with a trained mind—a man who knew the great fundamental principles upon which all business is built.

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The big fundamental principles behind your work

You feel and *know* that you have the capacity for greater success. But conscientious work *alone* will not fit you to get ahead. You must be *prepared* before you can hope to rise much above your present position. You must *master the big fundamental principles behind the work you are now doing and which underlie the job ahead of you.*

It is this broad grasp of the fundamentals of business that the Alexander Hamilton Institute is teaching to more than 50,000 men in America today.

Based upon the actual experience of thousands of successful business men

The Institute collects, classifies, and transmits to you, thru the Modern Business Course and Service, the best thought and practice in modern business. It will give you a thoro and sound training in the fundamental principles underlying all departments of business—it will give you a knowledge that could otherwise be obtained *only* by years of bitter experience—if at all.

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In the Standard Oil Co. 242 men are enrolled with the Alexander Hamilton Institute; in the U. S. Steel Corporation, 450; in the National Cash Register Co., 194; in the General Electric Co., 282; in the Pennsylvania Railroad, 87;—and so on down the list of the biggest concerns in America.

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Name

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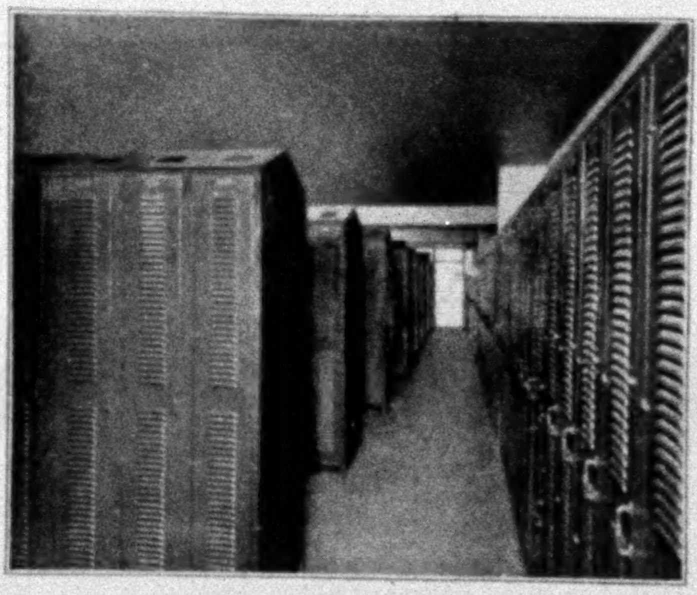

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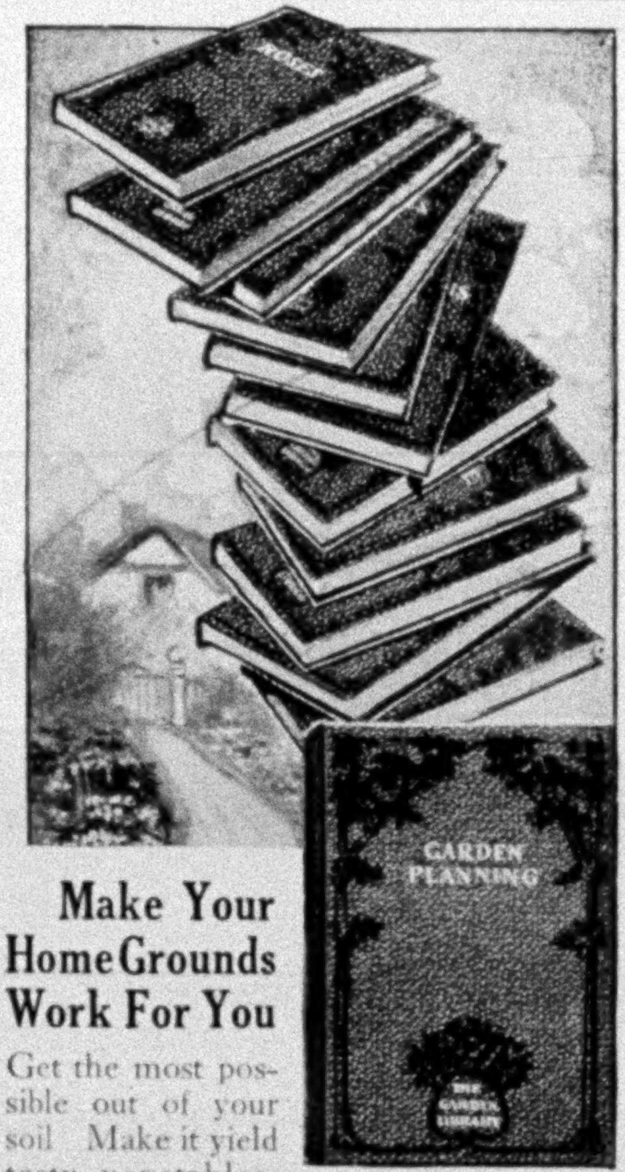

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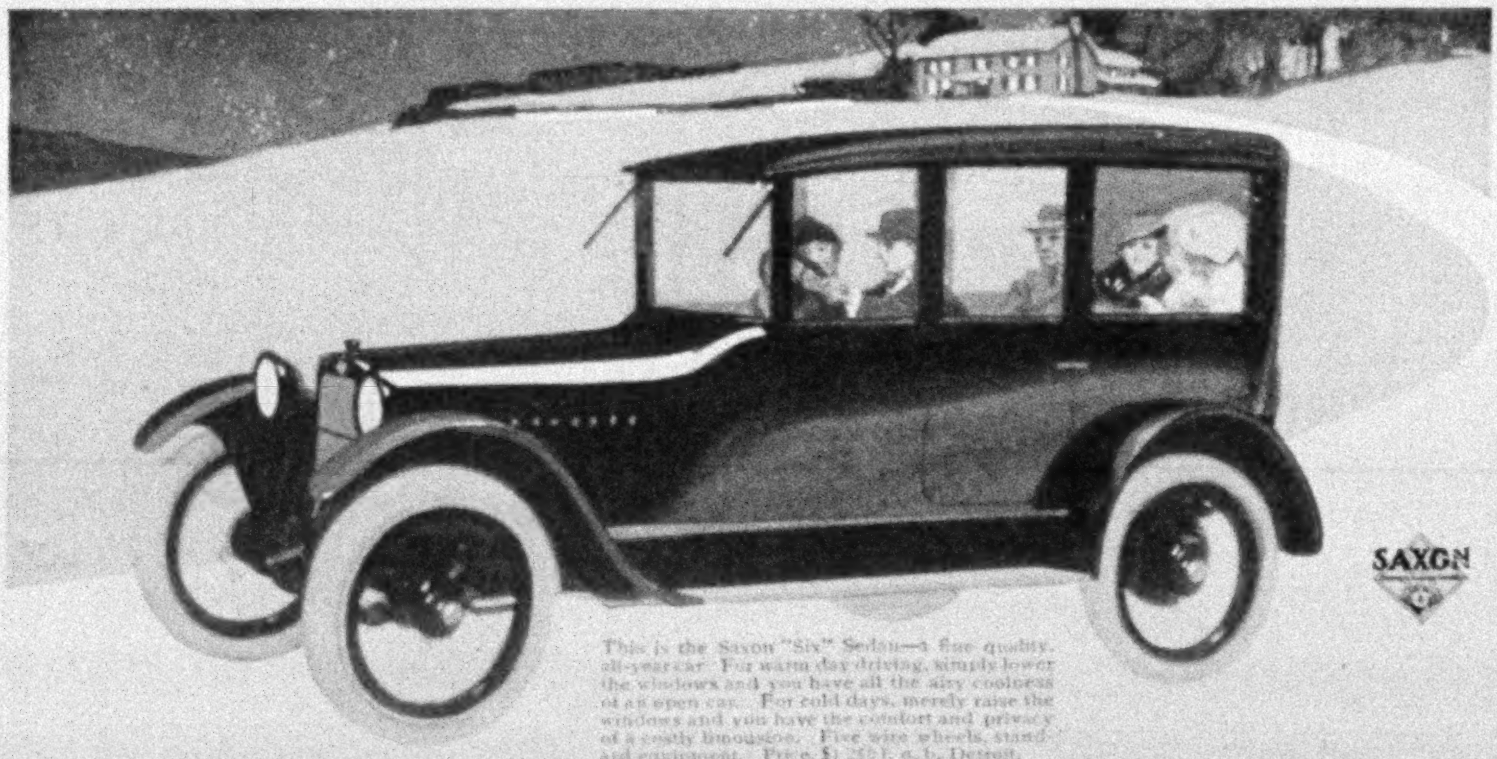

This is the Saxon "Six" Sedan—a fine quality, all-year car. For warm day driving, simply lower the windows and you have all the airy coolness of an open car. For cold days, merely raise the windows and you have the comfort and privacy of a costly limousine. Five wire wheels, standard equipment. Price, $1,250 f. o. b. Detroit.

There Is a Strong Public Belief In the Superiority of Saxon "Six"

At last it has dawned upon motor-car buyers in general that, strictly speaking, there is no rivalry between a car of less than six cylinders and Saxon "Six."

Why this is true is easily grasped.

With less than six cylinders propelling the car, there are bound to be slight intervals between explosions.

With six cylinders, as in Saxon "Six," these intervals between impulses are eliminated and the power-stream produced is of practically perfect continuity.

Necessarily, then, in the "less than six," with fewer impulses at any given time, the force of each impulse must be **more severe** upon all moving parts.

In Saxon "Six," for instance, as compared with one of the best known "less than six-cylinder" cars of like price, there is nearly 98% more impulses per minute at 20 miles per hour.

So naturally each impulse at any given time is far **less severe** upon moving parts.

A gradual awakening to the disadvantages of the "less than six" has incited buyers to a more careful investigation before purchasing.

And investigation has usually terminated in the same clear-cut conclusion—that Saxon "Six" is unmatched by any less-than-six-cylinder motor of like price.

So that public preference has swung strongly toward Saxon "Six" as the best car at less than $1,200.

To such an extent that production has never proved quite great enough to satisfy the demand.

This in the face of the fact that each year has seen double the number of Saxon "Sixes" built.

Saxon "Six," of course, has other very material advantages.

For one, it accelerates with unusual rapidity, going from standing start to 45 miles per hour in 23 seconds. That is 22% faster than the time of the best "less-than-six" we know of.

For another is the tremendous speed and power of Saxon "Six." There is a greater amount than you are ever likely to require. It is there, so that no set of road conditions can ever balk you.

And another is the economy of Saxon "Six" in the matter of repairs and gasoline, too. 206 stock model Saxon "Sixes" in a 300-mile none-stop run established an average of 23.5 miles per gallon of gasoline.

Saxon "Six" is $865.00 f. o. b. Detroit.

(709)

SAXON "SIX"

A BIG TOURING CAR FOR FIVE PEOPLE

Saxon Motor Car Corporation, Detroit

This Is Our Work

FULFILLING the vision of its founder, this institution serves and will continue to serve its double function in providing safe investments for the funds of the public and the upbuilding of this nation's permanent prosperity.

PROMOTING thrift, encouraging systematic accumulations, providing for such accumulations a form of investment unimpeachably conservative; and giving to each investor, large or small, a real, vital and profitable part in the material improving of this nation's great cities: This is our work.

S.W. STRAUS & CO.

Established 1882
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NEW YORK
150 Broadway

CHICAGO
Straus Bldg.

DETROIT
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Loeb Arcade Bldg.

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35 years without loss to any investor

A Comparison of Yields

Income from Municipal Bonds which we are now offering compared with that of similar bonds in January, 1901:

	1901	1916
Buffalo, N. Y.	3.15%	3.70%
Philadelphia, Pa.	2.90%	3.78%
South Carolina	3.70%	3.80%
St. Paul, Minn.	3.20%	3.82%
Lackawanna Co., Pa.	3.10%	3.82%
Baltimore, Md.	3.35%	3.90%
Hudson County, N. J.	3.25%	3.85%
New York City	3.00%	4.00%
Lakewood, Ohio	4.00%	4.20%

The Federal Income Tax Law of 1914 and the Postal Savings Act of 1910 (both revised in 1916) are factors to be considered in purchasing Municipal Bonds.

Send for Municipal List AN-54.

The National City Company

National City Bank Building
New York

ESTABLISHED 1865

All Essential Features of a Sound Investment

Namely

1. Fixed Security ample to safeguard the loan;
2. Net earnings of sufficient size and stability to assure prompt payment of interest and principal;
3. Such excellent quality that marketability under ordinary conditions is certain;
4. The obligation of an old, established, uniformly prosperous Company;
5. Offered and recommended by bankers with years of experience and success in this particular form of investment;
6. Attractive interest return—6%;

are combined in an issue of first mortgage bonds described in our Circular No. 961-D, which will be sent promptly upon request.

Peabody, Houghteling & Co.

(Established 1865)
10 South La Salle Street, Chicago

We Invest Our Own Money in Municipals Before We Offer Them to You

Before we invest in Municipal Bonds we have a corps of experts in our Buying Department investigate *every* detail of the transaction. This means when these bonds are offered to you they have measured up to our high standard.

Considering the safety and absolute dependability of Municipal Bonds, no securities offer a better yield. Twenty-seven years' experience has demonstrated this to us.

To thousands of experienced investors all over the country the house of William R. Compton Company stands first in conservatism, safety and service. We would like to serve you.

A Few of Our Attractive Municipal Issues:

	Rate	*Due*	*Yield About*
State of California. Direct Obligations......	4%	1985-Option 1950)	3.75%
City of New York. Direct Obligations.....	4¼%	1966	4.10%
City of El Paso, Texas. School Bonds......	5%	1954-55	4.20%
Lawrence Co., Tenn., Rds. Direct Obligations	5%	1936-56	4.50%
Haskell Co., Okla. Township Direct Obligations..............................	6%	1941	5.00%
Cypress Creek Drainage, District of Ark.....	5½%	1935-46	5.05%

We offer Municipal Bonds in $1000, $5,00, and $100 amounts netting 4% to 5½%. Send today to our nearest office for our Free Booklet, N 1, "The Premier Investment," and large list of offerings.

William R. Compton Company

Municipal Bonds
"Over a Quarter Century in This Business"

New York
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105 S. La Salle Street

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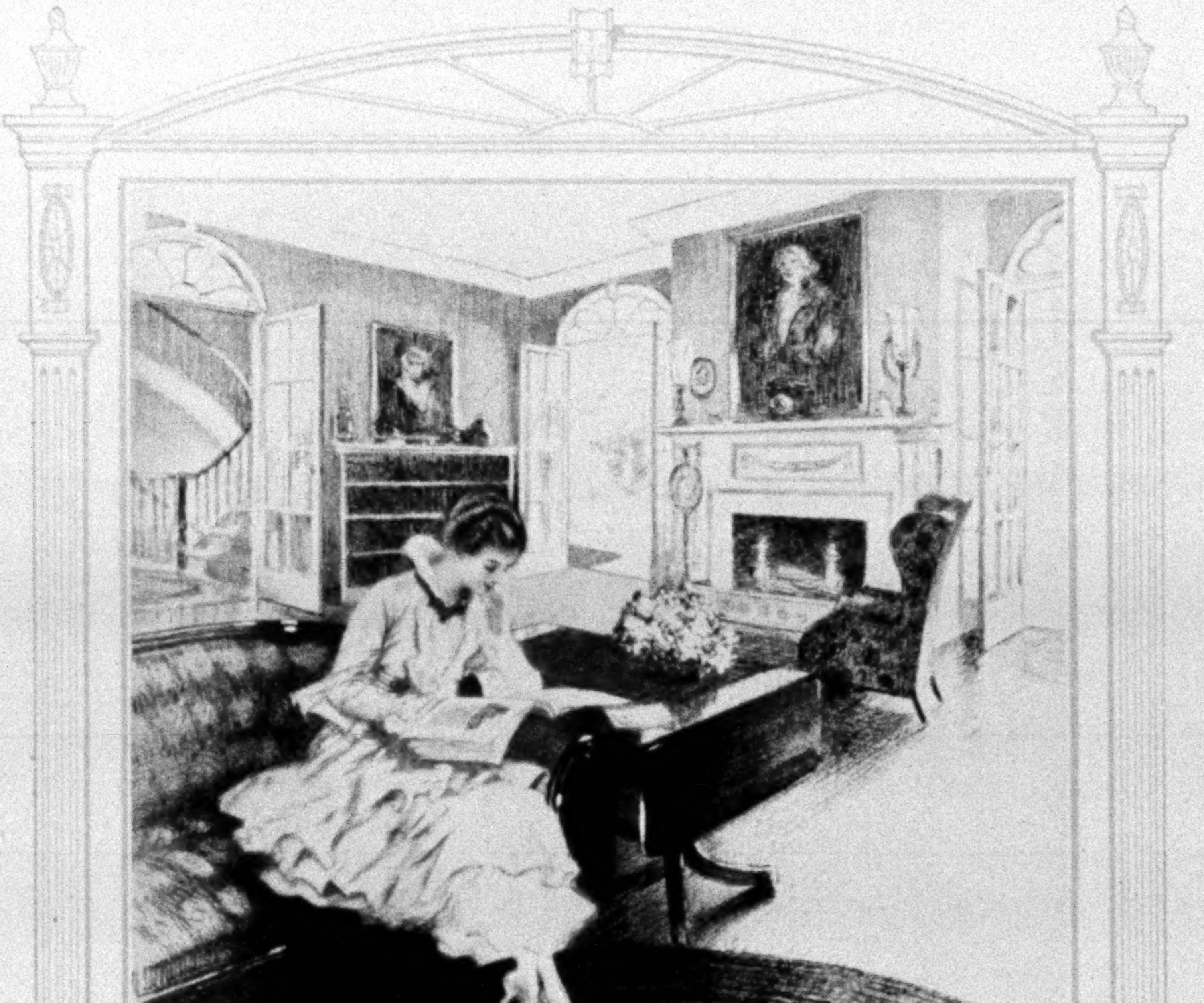
Cincinnati
102 Union Trust Bldg.



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THE charm of the Colonial is the inspiration for many of the most beautiful homes of today. Fortunately the return to white and mahogany comes at a time when almost every housekeeper knows the easy, successful way to take care of finely finished woodwork and furniture.

Like most other articles that cannot be cleaned safely or satisfactorily by ordinary methods, enameled wood trim and choice pieces of cabinet work require only the judicious application of Ivory Soap to look their best.

Ivory Soap removes the dirt without harming the finish. Its mild, white, pure, neutral lather does nothing but cleanse. Being free from alkali and all harsh materials, it is perfectly safe. Being free from unsaponified oil, it leaves no greasy film.

Just the usual care which common sense suggests when applying water to a finished wood surface—lukewarm suds, dampening only a small part at a time, prompt drying with a chamois skin—insures success with Ivory Soap.

Directions for cleaning over a hundred articles not ordinarily washed with soap and water are included in this booklet, "Unusual Uses of Ivory Soap". Thousands of women have found it very helpful. You should have a copy. It is free. Address The Procter & Gamble Co., Dept. 23-A, Cincinnati, O.

IVORY SOAP . . . . 99 44/100 % PURE

VOL. XXXI, No. 1 WASHINGTON JANUARY, 1917

THE NATIONAL GEOGRAPHIC MAGAZINE

OUR BIG TREES SAVED

IN THE scenic heart of the Sequoia National Park, the only section of the magnificent 160,000-acre playground situated in California which is at the present time accessible to motor-driven and horse-drawn vehicles, stands a group of trees, the *Sequoia washingtoniana*, known as the Giant Forest, and in this forest grow the loftiest and most venerable living things that Nature has produced.

The Sequoia National Park was constituted a government preserve to safeguard these very trees, some of which were 2,000 years old when the Christian era dawned. But it was a preservation that did not protect, for the very acres upon which grew the finest specimens of the *Sequoia washingtoniana* remained in the possession of private parties to whom they had been patented before the park was created.

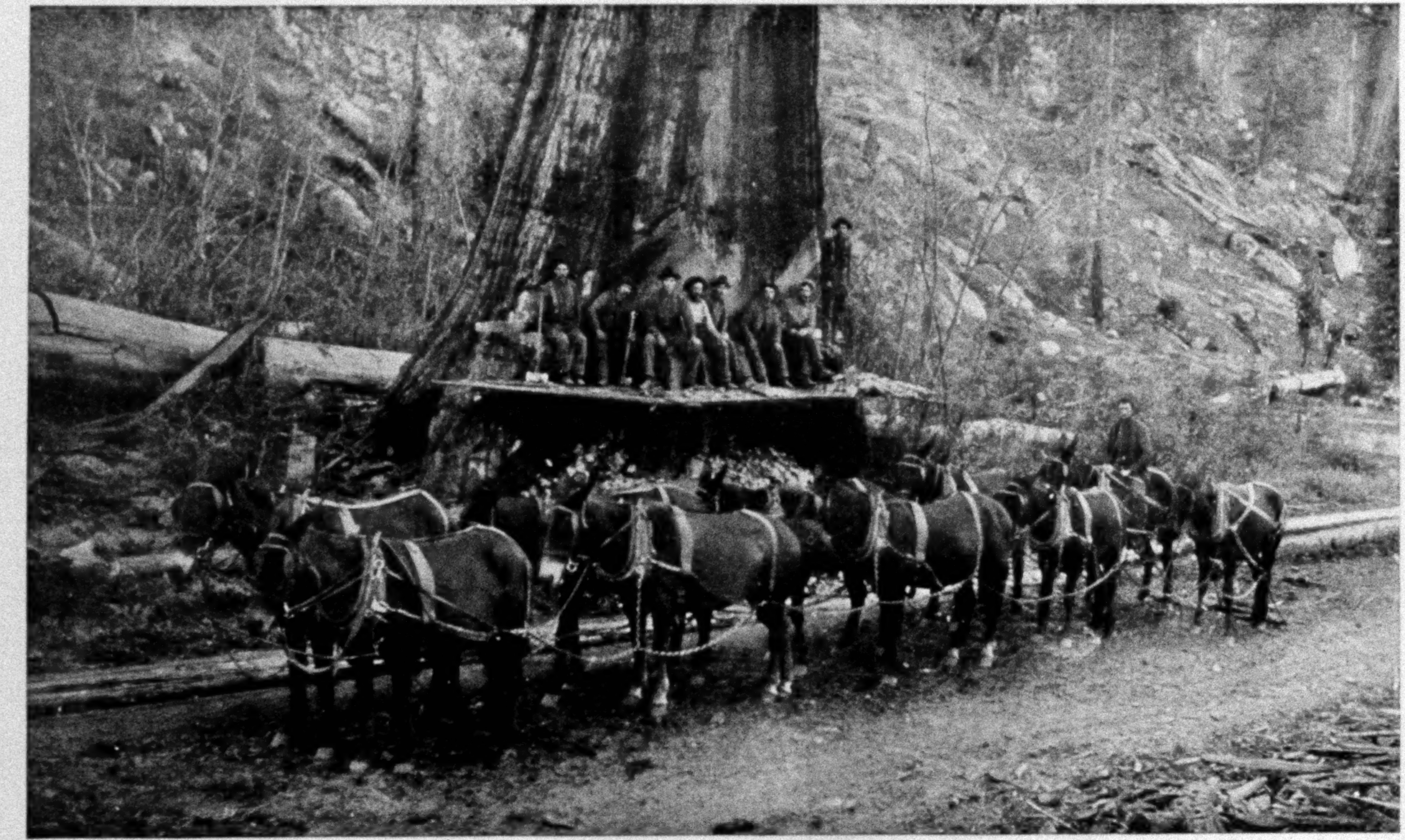
Some months ago the Department of the Interior, realizing that the constantly increasing value of timber had become a rapidly growing temptation to these owners to convert the trees into lumber, secured from Congress an appropriation of $50,000 to purchase the coveted land. When the effort was made to buy the holdings, however, it was discovered that the owners could not fairly part with their sequoia trees except on condition that adjacent property be purchased also, the supplementary lands bringing the price up to $70,000.

After learning from their expert appraisers that the actual market value of the timber standing on these holdings amounted to $156,000, and that the price of $70,000 was, therefore, most reasonable, showing that the owners wished to coöperate in their preservation, the department secured an option on the land for six months.

With the expiration of the option only three weeks off, and with no prospect of being able to secure the necessary additional appropriation of $20,000 from Congress during its pre-holiday session, the Department of the Interior had practically lost all hope of saving these most highly prized of all trees for the American people.

In this predicament one of the officials of the department recalled the splendid work which has been done for a number of years by the National Geographic Society in stimulating public interest in the preservation of the nation's playgrounds and in safeguarding our song birds and wild life. Why not appeal to this Society, whose more than half a million members represent every State in the Union, and who would be deeply interested, individually as well as collectively, in the preservation of this forest wonderland? The suggestion was adopted and the appeal was submitted to the Society's Board of Managers.

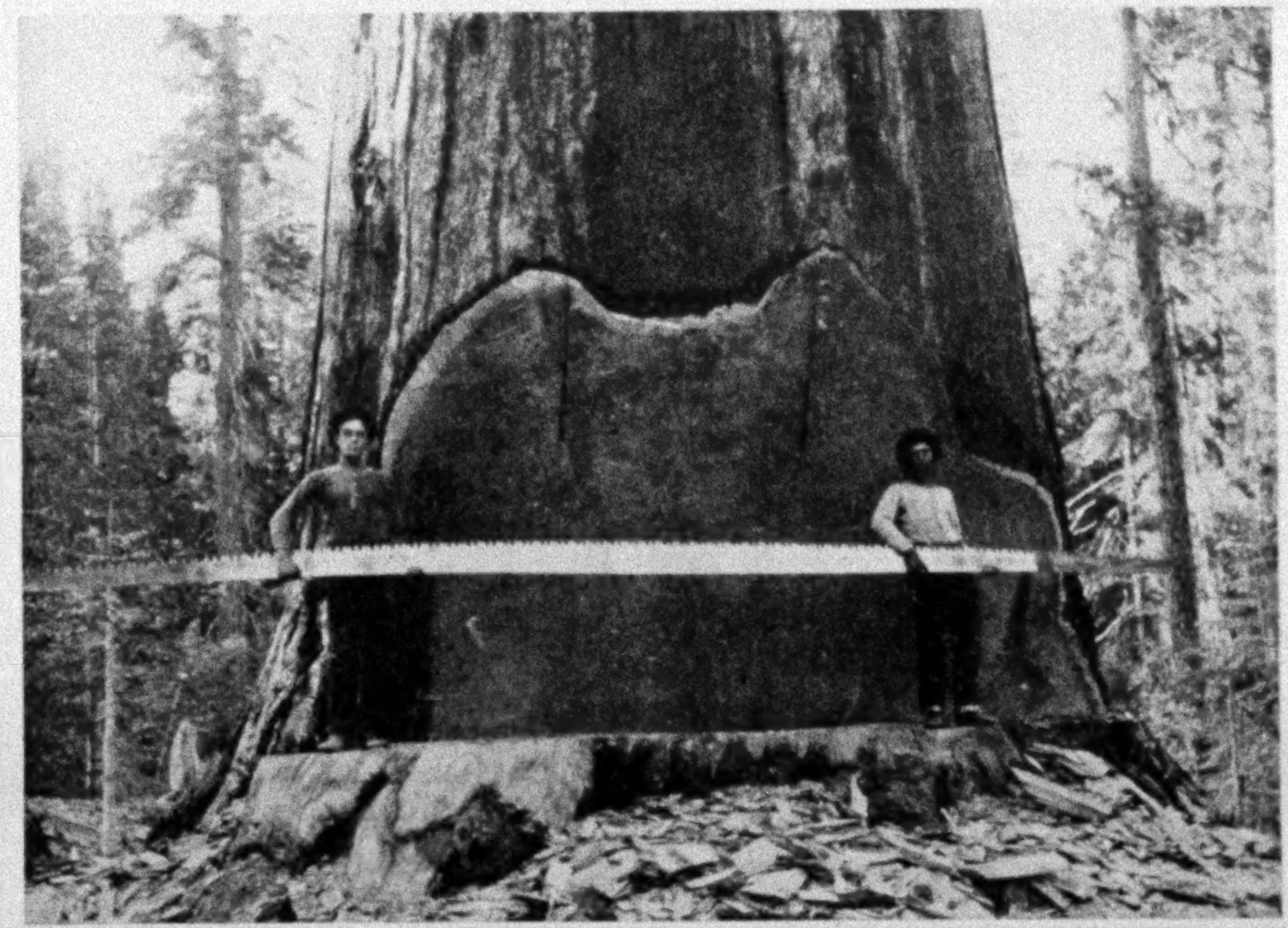
As was so earnestly hoped, the Society's governing body immediately appreciated the exceptional opportunity which was about to be lost to the American people, and at a meeting attended by every member of the Board excepting two, who were out of town, gladly appropriated the necessary $20,000. And thus was accomplished a unique coöperation of a great national scientific society



Photograph by A. R. Moore

THE ONE ENEMY THE BIG TREE FEARS—THE LUMBERMAN

In felling a big tree a platform is first built above the buttresses of the trunk. On this two men stand, each with a double-bladed axe, with which, with broad swinging strokes, they gradually chop their way in to the heart. Then with a long cross-cut saw they attack it from the other side. With smooth, flowing movement, rather than rough, jerking motion, they pull the keen-toothed blade back and forth, keeping it well greased all the time, until they approach the center from that side. A series of wedges follow the saw to keep the tree from settling and closing the path it has cut. These wedges gradually force the giant over toward the chopped side until finally, with a mighty swaying, it passes out of the perpendicular, and with a crash like the terrific roar of a raging sea falls prone along the line predetermined for its cradle.



Photograph by A. R. Moore

A 25-FOOT SAW USED FOR FELLING BIG TREES

While wedges are required to keep the tree from "pinching" the saw, and a good supply of axle grease or other lubricant is necessary to overcome friction, elbow grease in liberal quantities is the first essential in handling one of these big blades.

with the national government, whereby one of the country's noblest scenic resources has been presented to the American people for their perpetual enjoyment.

When one recalls that the Giant Forest is the largest intact body of trees of this species in existence, with the General Sherman as its king—a wonderful specimen 103 feet in circumference, 280 feet tall, as high as the dome of the National Capitol* — our hearts thrill that these masterpieces of nature have been rescued from the axe.

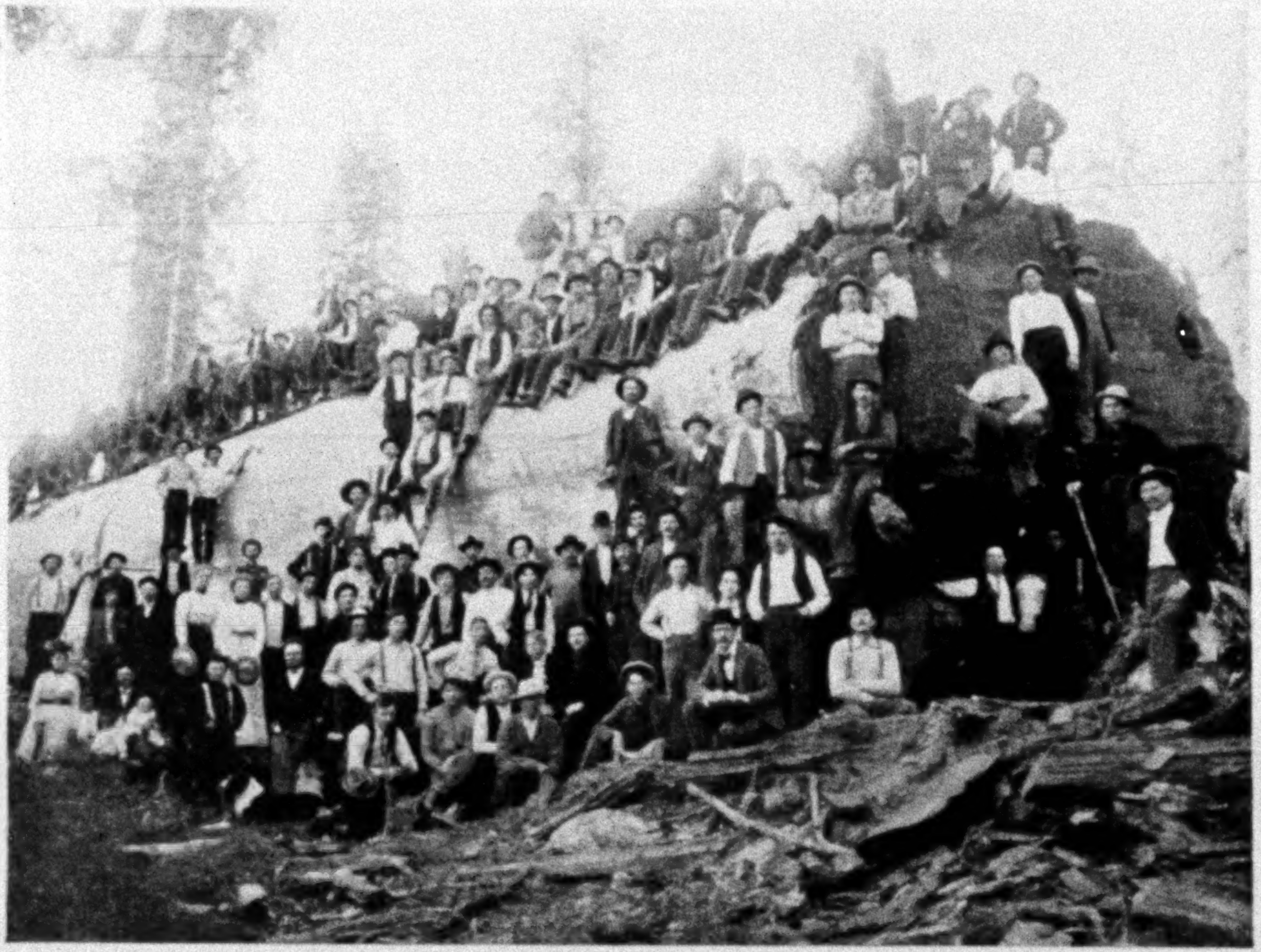
A thousand years may not bring them to their full stature, but a few days may wipe them out forever. Unafraid of wreck and change, untouched even by "time's remorseless doom," they have come down to us through centuries—aye, through millenniums; and now will live on through other centuries, a link to bind the future with the past.

Whoever has stood beneath these towering giants of the forest feels a reverent love for these grizzled patriarchs! The oldest living thing! There is not a nation on the face of the earth today but what was born, mayhap, a thousand years after they reached their maturity.

Nations have risen, reached their prime, and passed on to the decay and oblivion that is the ultimate fate of all things temporal, and other nations have succeeded them, in their turn to be followed by still others, since the great trees began their existence. World powers have arisen, run their course, and disappeared—meteors, as it were—in the sky of history, and the big trees still live on!

Who could replace them? Not man, for never yet in all his existence has he had continuity of purpose enough to plan 2,000 years ahead. The mutations of time in twenty centuries leave only here and there a silent monument to speak of the past, and even these have been the prey of generations coming after their builders. Some of the most magnificent marbles in Athens and Rome were burnt

*A photogravure of this magnificent tree, 23 x 8½ inches, was published in the April, 1916, number of the GEOGRAPHIC MAGAZINE.



Photograph by A. R. Moore

A CALIFORNIA SEQUOIA WASHINGTONIANA LOG, 26 FEET IN DIAMETER

A thousand years scarcely serve to bring a sequoia to its maturity, and it may be hale and hearty still when three thousand summer suns have looked down upon it; but a day may lay it low forever.

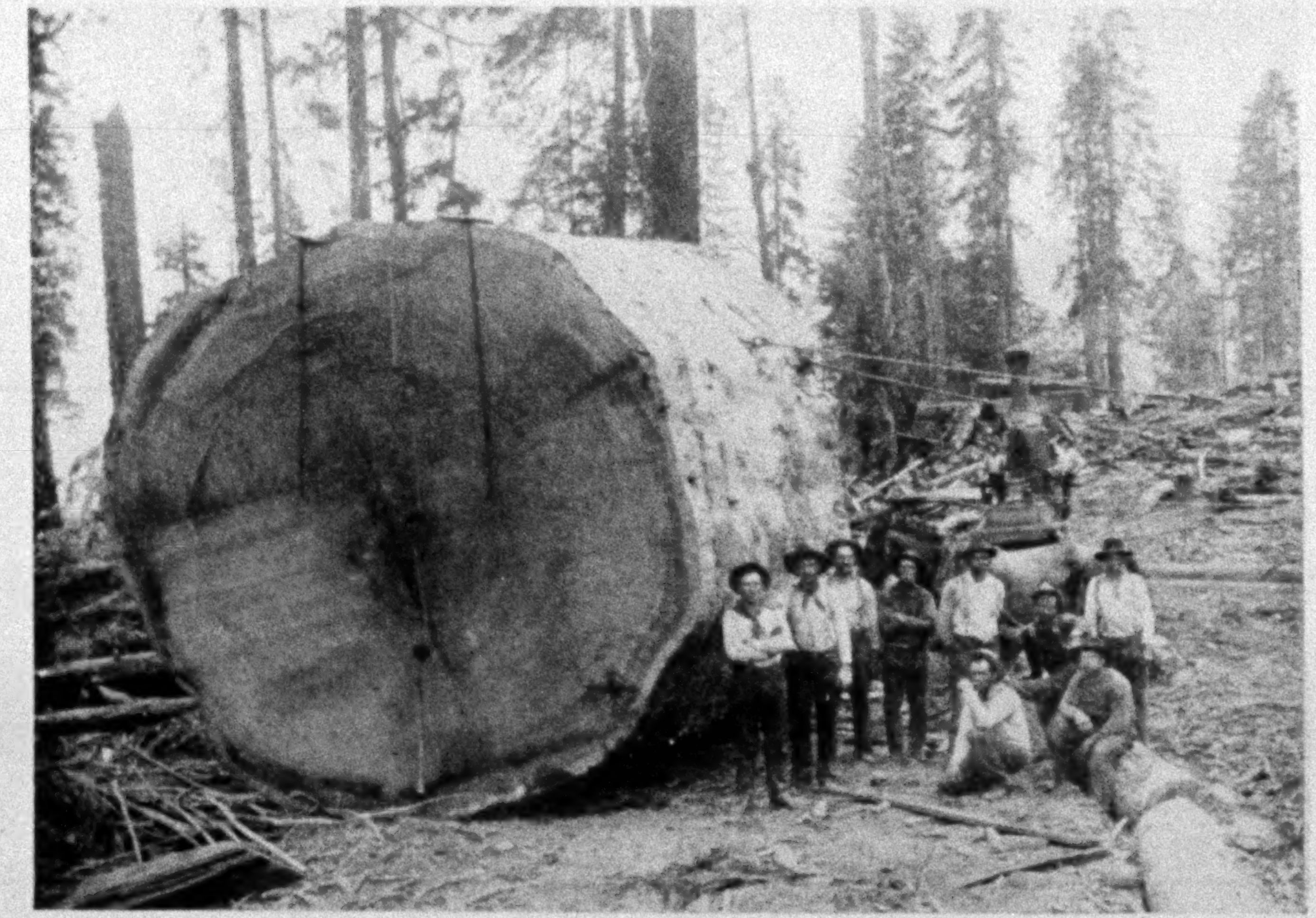
into lime for agricultural purposes, and even the Pyramids have served as quarries to the indifferent successors of those who raised them.

Yet when unnumbered thousands of Egyptian slaves were laboriously transporting the stones for Cheops across the Nile Valley and hoisting them into position, these hoary old veterans of the California mountains were sturdy saplings.

The human progress they must have witnessed! In their early youth the children of Israel were wandering through the Wilderness of Sin. When the Star of Bethlehem shone down over that lowly manger in Judea, proclaiming the second deliverance of mankind, who knows but that these monarchs of the California forest which have just been rescued from the woodman's axe joined in singing "Glory to the Highest," as the winds of the East swept over the West!

The very race that has risen up to save them was perhaps overrunning Europe, wrapped in skins, living by the chase, and using the bow and arrow, when they were taking root. Instead of medicine, men were resorting to amulets and charms. The most complicated piece of machinery that had yet been invented was the hand-loom. There was not a screw, a bolt, or a nut in existence. There was no printing press, no steam-engine, no microscope, no telescope, no telegraph, no telephone. The tallow dip was the only method of lighting; the caravan, the sail and row boat, and the runner were the only means of international communication.

As a hunter keeps a record of the bears he has killed by the notches in his gunstock, so the big tree keeps an account of the years it has lived by rings concealed within its trunk. Every year that it lives it grows in girth a tiny bit—in youth faster, in age slower, in fat years more and in lean ones less. But it never fails to add its ring with each passing year. Examine the next pine stump you come to and you will see how these rings start out from the center like those on the



Photograph by A. R. Moore

A CALIFORNIA LOGGING SCENE

In estimating the age of a standing tree the rings on the end of a log of a fallen one are counted, and the number of years required for an inch of average circumferential growth determined. If the fallen tree is in the immediate neighborhood and of approximately the same diameter of the one whose age is to be estimated, the remainder of the problem is simply one of determining this diameter in inches and multiplying it by the average number of rings to the inch.

water of a pond where a pebble falls. Count them and you can know to a certainty the age of the tree.

The purchase was completed and the title to the Big Trees passed to the U. S. Government on January 17, 1917.

By direction of the Board of Managers of the National Geographic Society, the official correspondence on the subject is published below.

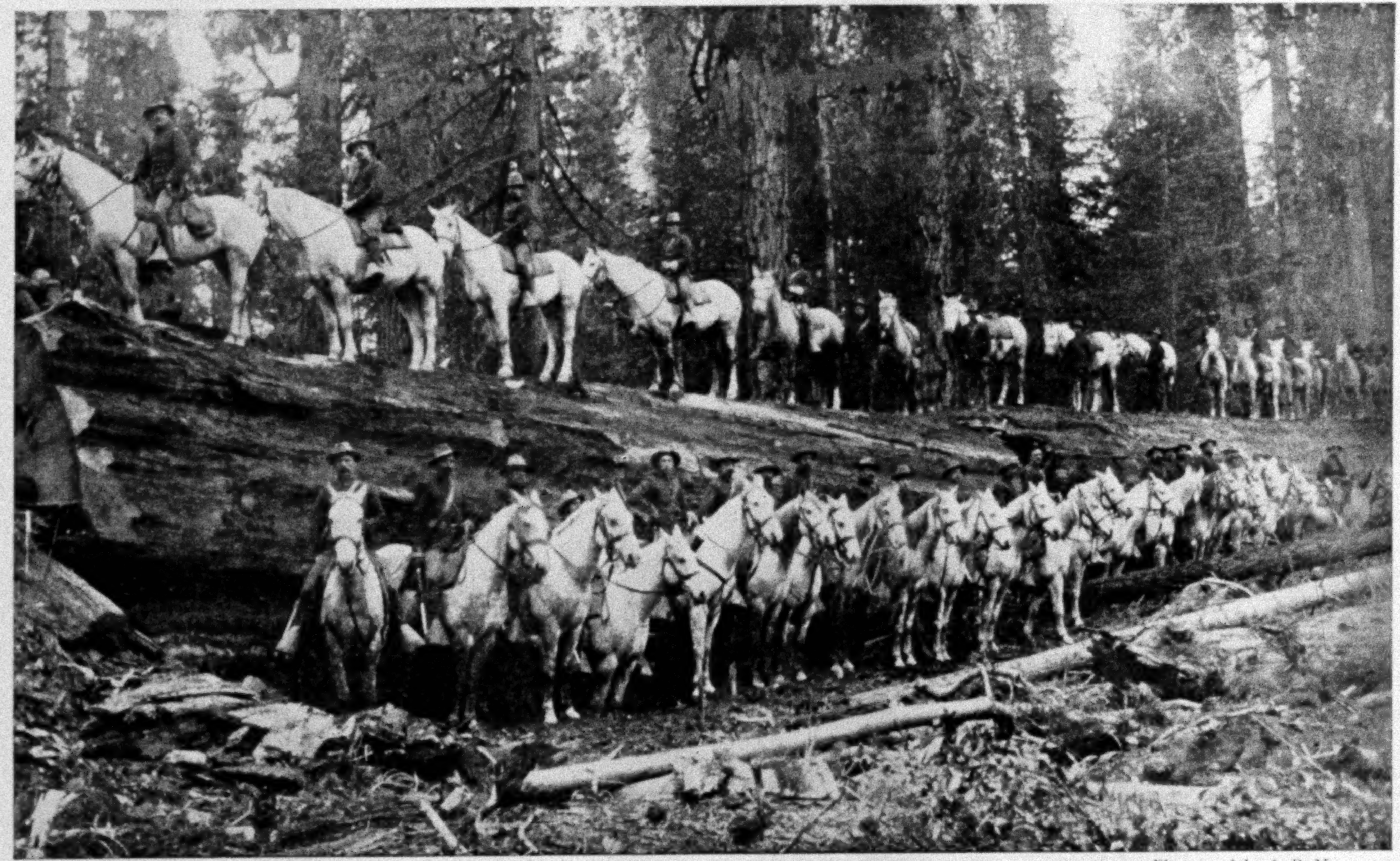
NATIONAL GEOGRAPHIC SOCIETY,
NOVEMBER 11, 1916.

DEAR SECRETARY LANE:

I have much pleasure in advising you that the Board of Managers of the National Geographic Society, being informed of your efforts to enable the United States Government to secure possession of the Giant Forest in the Sequoia National Park, and of the urgent necessity of $20,000 being made immediately available for the purchase (in addition to the $50,000 appropriated by Congress for the purpose), at a meeting yesterday unanimously adopted the following resolution:

"*Resolved,* That the Board of Managers of the National Geographic Society authorizes the expenditure of not exceeding $20,000 for the purchase of private lands in the Sequoia National Park, to be donated to the National Government for park purposes, in accordance with the provisions of the Act of Congress, July 1, 1916, Public 132, 39 Stat., 308, and that this sum shall be paid from the Research Fund of 1916; and that there is given to the President, the Director and Editor, and the Chairman of the Finance Committee, as representatives of the Society, authority to arrange with the Secretary of the Interior the details of the purchase and donation."

The National Geographic Society has watched with keen interest the rapid development of our national parks by the Department of the Interior and heartily



Photograph by A. R. Moore

A TROOP OF UNITED STATES CAVALRY AND A FALLEN SEQUOIA

Three thousand fence-posts, enough to fence in 8,000 acres of ground; some 700,000 shingles, enough to cover seventy houses, may be gotten from a single one of these big trees

Photograph by A. R. Moore

A GIANT SEQUOIA THAT SPLIT IN FALLING

John Muir counted four thousand rings from the heart out of one fallen giant. That tree was a thrifty sapling when Abraham went into Egypt. It was already a seed-bearer when Sodom and Gomorrah were destroyed. It was as old as American civilization when Joseph was sold into Egypt. It was nearly a thousand years old when David slew Goliath. And it was older when Christ was born than the Christian religion is today.

congratulates you upon the work which you have done in safeguarding these great national playgrounds for the coming generations and in making them accessible to visitors.

Assuring you that the National Geographic Society, through its Board of Managers, is very glad to have the privilege of coöperating with the government in preserving these priceless natural treasures to posterity, I am,

Yours very sincerely,
GILBERT H. GROSVENOR.

THE SECRETARY OF THE INTERIOR,
NOVEMBER 20, 1916.

MY DEAR MR. GROSVENOR:

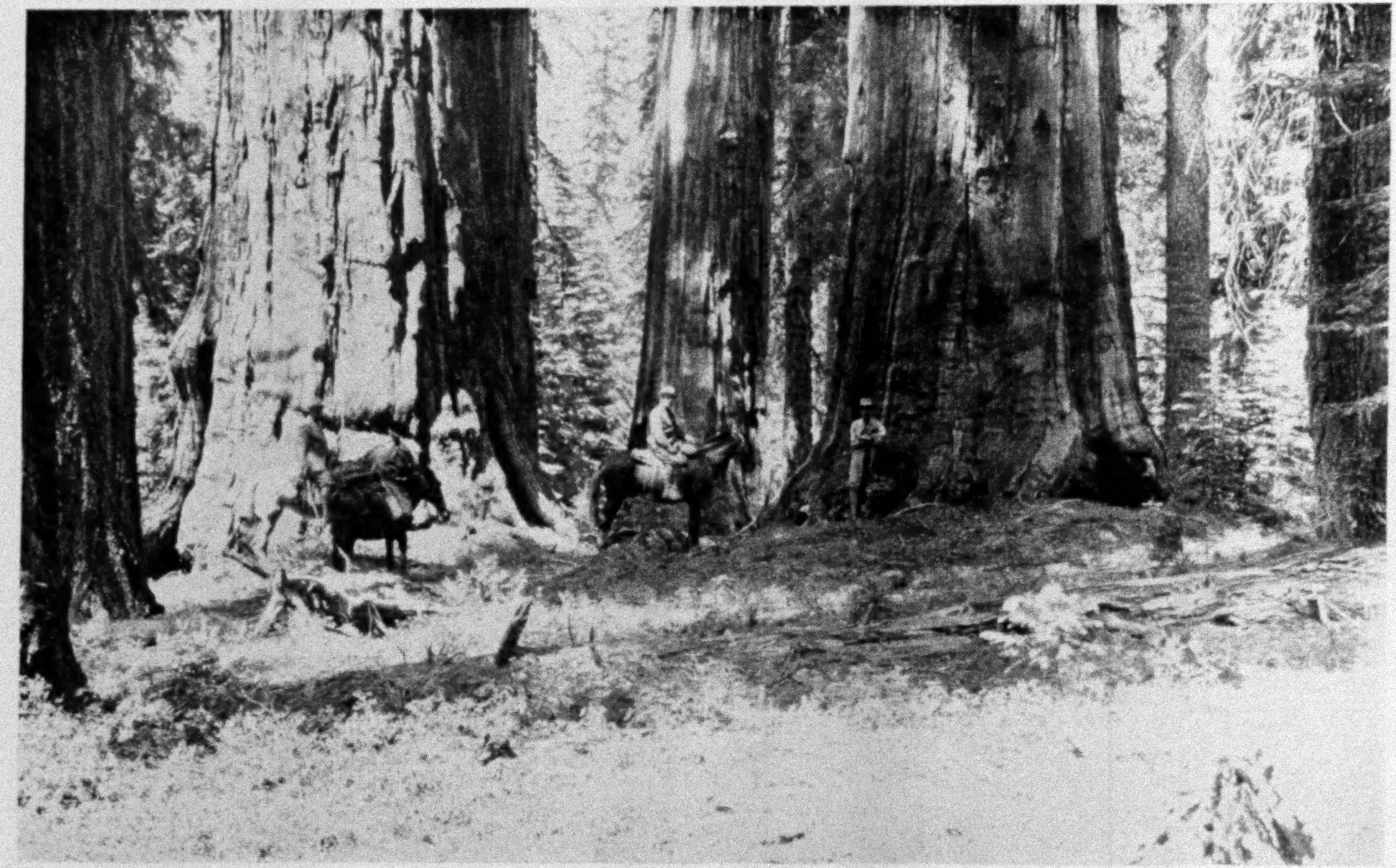
I beg to acknowledge your favor setting forth the resolution of the National Geographic Society by which it is made possible for us to secure, on behalf of the government, certain of the private lands in the Giant Forest of the Sequoia National Park.

This act on the part of your Society I know will meet with the highest commendation from its great membership, because thereby you render to the Government of the United States and to all of its people a lasting service and in a sense create a monument to the honor of your Society itself.

The trees which your money, together with that appropriated by Congress, enable us to purchase are the oldest living things upon this continent. They are the original pioneers. To have them fall before the axe of the woodman would have been a lasting crime, reflecting seriously upon the people of our country.

It will be many centuries before they die, and throughout their life I hope it may be known that they were kept alive by the generosity and foresight of your people. We will be pleased to have placed on one of the trees of the grove a tablet of commemoration.

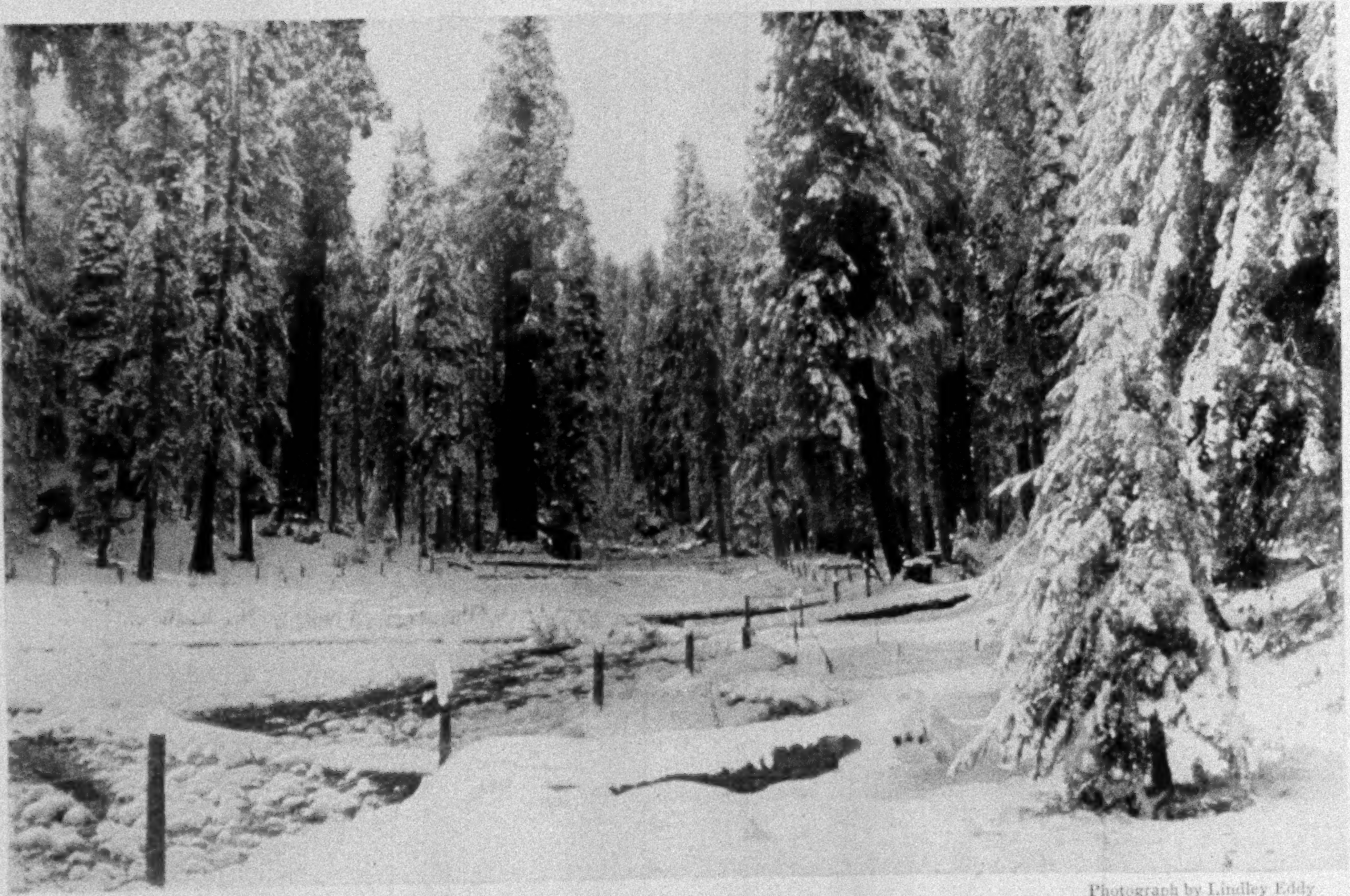
Cordially yours,
FRANKLIN K. LANE.



Photograph by Gilbert H. Grosvenor

SOME OF THE BIG TREES IN SEQUOIA NATIONAL PARK

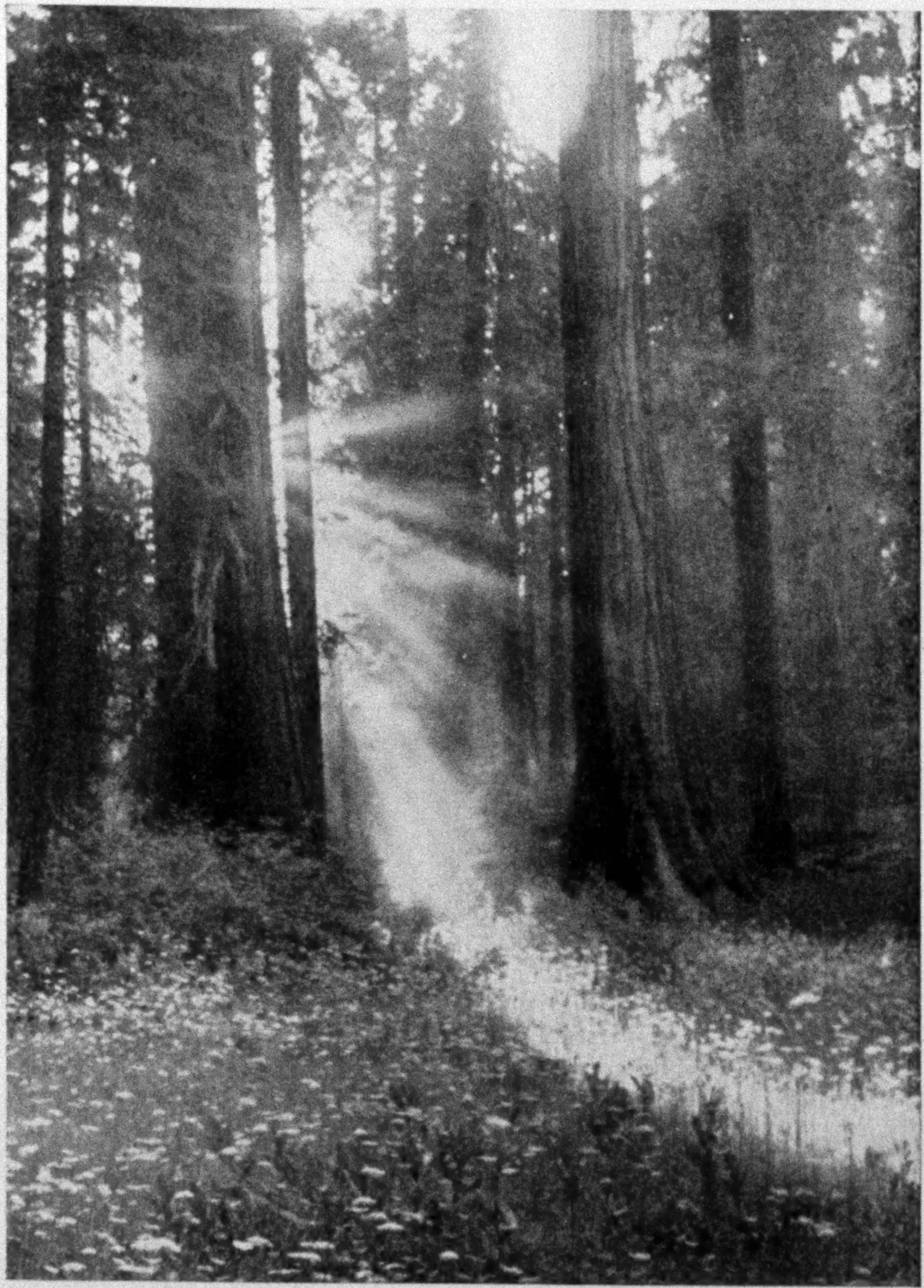
Their buttressed bases, their perpendicular ridges of bark, and their crown of branches make them seem indeed giant fluted columns, with nature-chiseled capitals, upon which rests the blue vault of heaven itself



Photograph by Lindley Eddy

GIANT FOREST IN WINTER

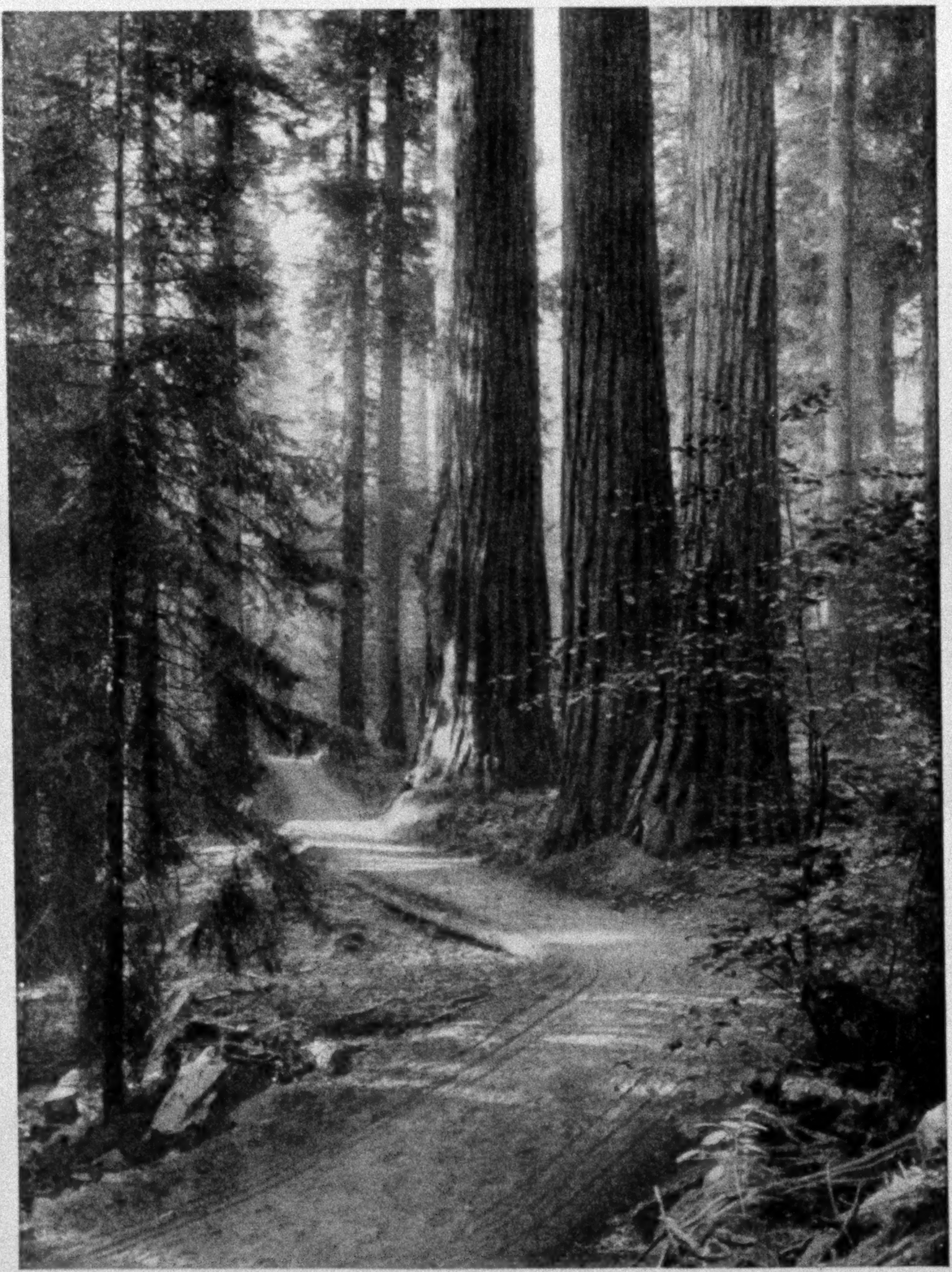
The lightnings of ten thousand clouds have left them unharmed; the snows of a thousand winters have not broken them; the fury of ten thousand storms has been withstood; the insect foes of forty centuries have left them as uninjured as is the ocean itself by the storms that lash its bosom.



Photograph by Lindley Eddy

ONE OF GOD'S FIRST TEMPLES, IN THE GIANT FOREST

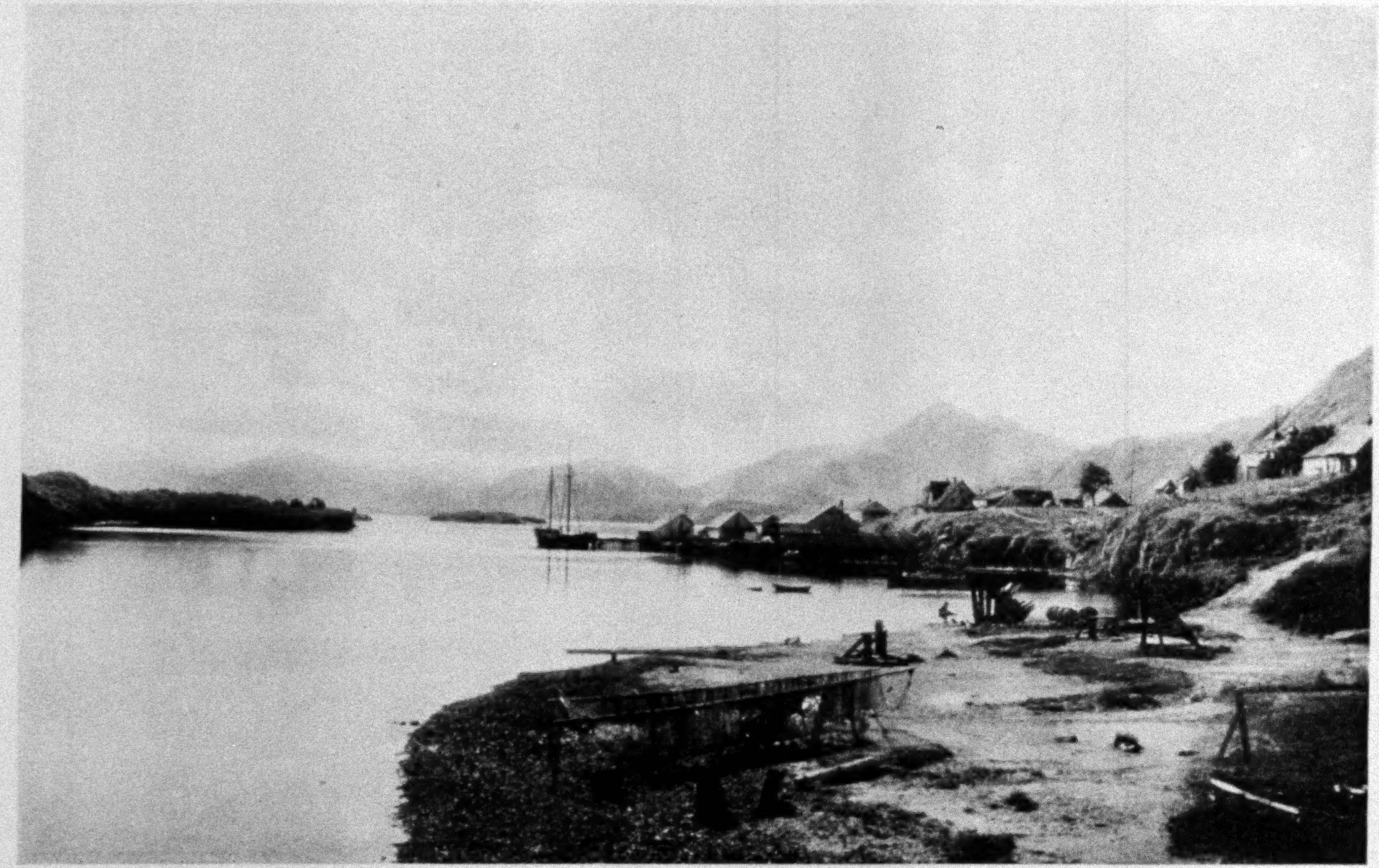
Dead indeed must be the soul of the man whose heart is not quickened, whose spirit is not moved to reverence, whose thoughts do not reach out and beyond, and whose inmost being does not look up through Nature to Nature's God, amid such surroundings as these!



Photograph by Lindley Eddy

IN THE HEART OF THE GIANT FOREST

"The big tree is Nature's masterpiece. It has a strange air of other days about it, a thoroughbred look inherited from the long ago—the auld lang syne of trees. . . . As far as man is concerned, it is the same yesterday, today, and forever—emblem of permanence."—John Muir.



Photograph by D. B. Church

THE WATERFRONT AT KODIAK

Although appearing on all the maps in heavy type, Kodiak is a sleepy village of four hundred people. It is nevertheless the center of a large and potentially important district.

THE VALLEY OF TEN THOUSAND SMOKES

National Geographic Society Explorations in the Katmai District of Alaska

By Robert F. Griggs, of the Ohio State University

Leader of the Society's Mount Katmai Expeditions of 1915 and 1916

THE eruption of Mount Katmai in June, 1912, was one of the most tremendous volcanic explosions ever recorded. A mass of ash and pumice whose volume has been estimated at nearly five cubic miles was thrown into the air. In its fall this material buried an area as large as the State of Connecticut to a depth varying from 10 inches to over 10 feet, while small amounts of ash fell as much as 900 miles away.

Great quantities of very fine dust were thrown into the higher regions of the atmosphere and quickly distributed over the whole world, so as to have a profound effect on the weather, being responsible for the notoriously cold, wet summer of that year.

The comparative magnitude of the eruption can be better realized if one should imagine a similar eruption of Vesuvius. Such an eruption would bury Naples under 15 feet of ash; Rome would be covered nearly a foot deep; the sound would be heard at Paris; dust from the crater would fall in Brussels and Berlin, and the fumes would be noticeable far beyond Christiania, Norway.

Readers of The Geographic will remember the accounts of the eruption by Capt. K. M. Perry and Dr. Geo. C. Martin, which appeared in the magazine for August, 1912, and February, 1913, respectively.

Fortunately the volcano is situated in a country so sparsely inhabited that the damage caused by the eruption was insignificant—very much less than in many relatively small eruptions in populous districts, such as that of Vesuvius, which destroyed Pompeii and Herculaneum. Indeed, so remote and little known is the volcano that there were not any witnesses near enough to see the eruption, and it was not until the National Geographic Society's expeditions explored the district that it was settled definitely which of several near-by volcanoes was really the seat of the disturbance.

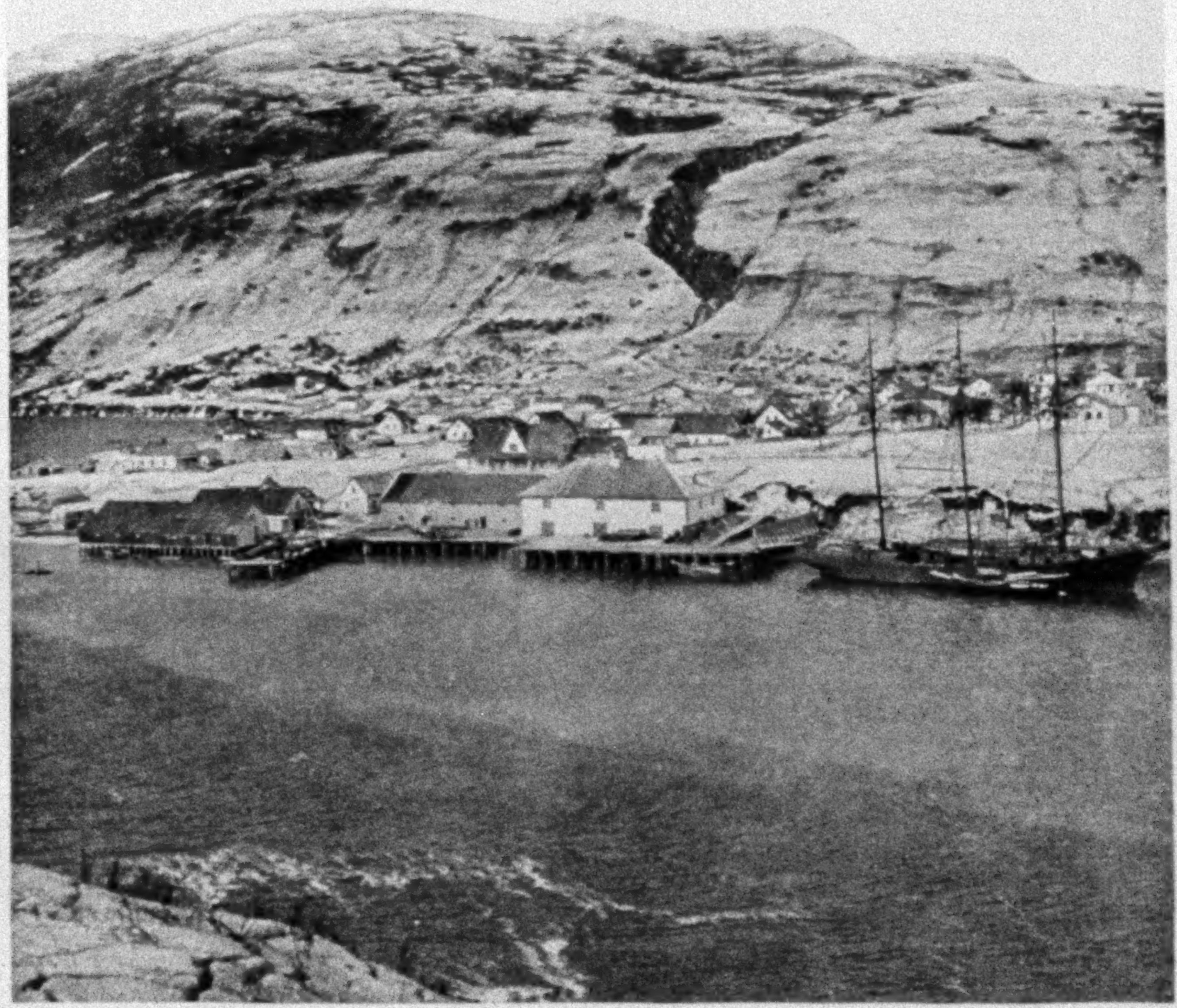
The most important settlement in the devastated district is Kodiak, which, although a hundred miles from the volcano, was buried nearly a foot deep in ash. This ashy blanket transformed the "Green Kodiak" of other days into a gray desert of sand, whose redemption and revegetation seemed utterly hopeless. When I first visited it, a year later, it presented an appearance barren and desolate. It seemed to every one there that it must be many years before it could recover its original condition.

THE ERUPTION WAS THE BEST THING THAT EVER HAPPENED TO KODIAK

What, then, was my surprise on returning after an interval of only two years to find the ash-laden hillsides covered with verdure. Despite the reports I had received, I could not believe my eyes. Where before had been barren ash was now rich grass as high as one's head.

Every one agrees that the eruption was "the best thing that ever happened to Kodiak." In the words of our hotel keeper, "Never was any such grass known before, so high or so early. No one ever believed the country could grow so many berries, nor so large, before the ash."

Were the title not preëmpted, Kodiak might have been called the "Emerald Isle" quite as well as Ireland. Its situation in the Pacific is indeed very similar to that of Ireland in the Atlantic, for it



THE TOWN OF KODIAK, ALASKA, AFTER THE ERUPTION OF KATMAI

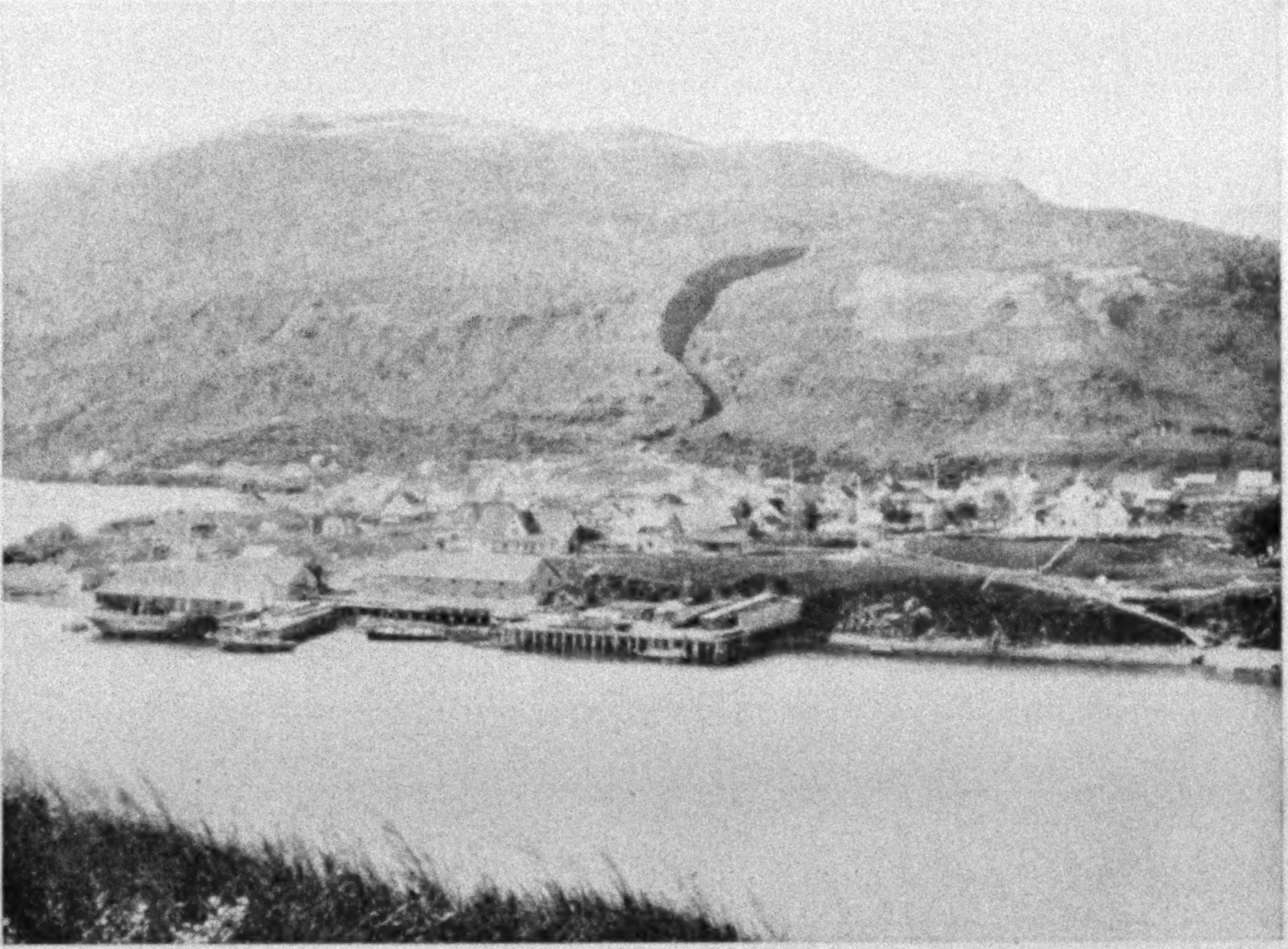
The town is 100 miles from the volcano. Note the heavy deposits of white ashes covering hillsides and town. Dust fell as far away as Juneau, Ketchikan, and the Yukon Valley, distant 750, 900, and 600 miles, respectively, from the volcano.

owes its climate, as does Ireland, to the tropical ocean current which bathes its shores. It is indeed a hundred and fifty miles farther north than Ireland, but this is more than counterbalanced by the protection from the Arctic Ocean afforded by the mainland.

Many people will no doubt be astonished to learn that the winter of Boston is far more severe than that of Kodiak, which more nearly resembles that of Washington, D. C. Indeed, an old lady, who had lived all her life in Kansas, found on returning there after two or three winters in Kodiak that the climate was almost unbearable and has been anxious ever since to return to the mild climate of Kodiak.

The eastern half of the island is occupied by a dense forest of spruce, whose trees reach a great size. Beyond the forest it is covered by a luxuriant grass land, which, in the abundance and fine quality of its hay and forage, surpasses any grazing lands in the United States proper and finds a parallel only in the "guinea-grass" pastures of the tropics.

At present this country is lying almost entirely neglected, but as Alaska passes from the stage of exploitation to that of development, these lands are destined to be much sought after for stock-raising.



Photograph by R. F. Griggs

KODIAK FROM THE SAME POSITION FOUR YEARS LATER, AUGUST 25, 1916

Kodiak enjoys the unique distinction of having been benefited by a volcanic eruption. The grass has come through the ash better than ever before. The whole hillside has come up to grass as abundantly as the foreground.

The eruption, of course, destroyed these pastures, so that the live stock nearly perished from starvation. The herd of the Government Experiment Station was shipped back to the States until it could be determined whether it might be possible to grow forage enough to support them on the ash-covered land. When they were shipped there was scant hope that they could ever be brought back again; but at the end of only two years the pastures had so far recovered that they were returned with full assurance that they could be maintained without difficulty (see page 22).

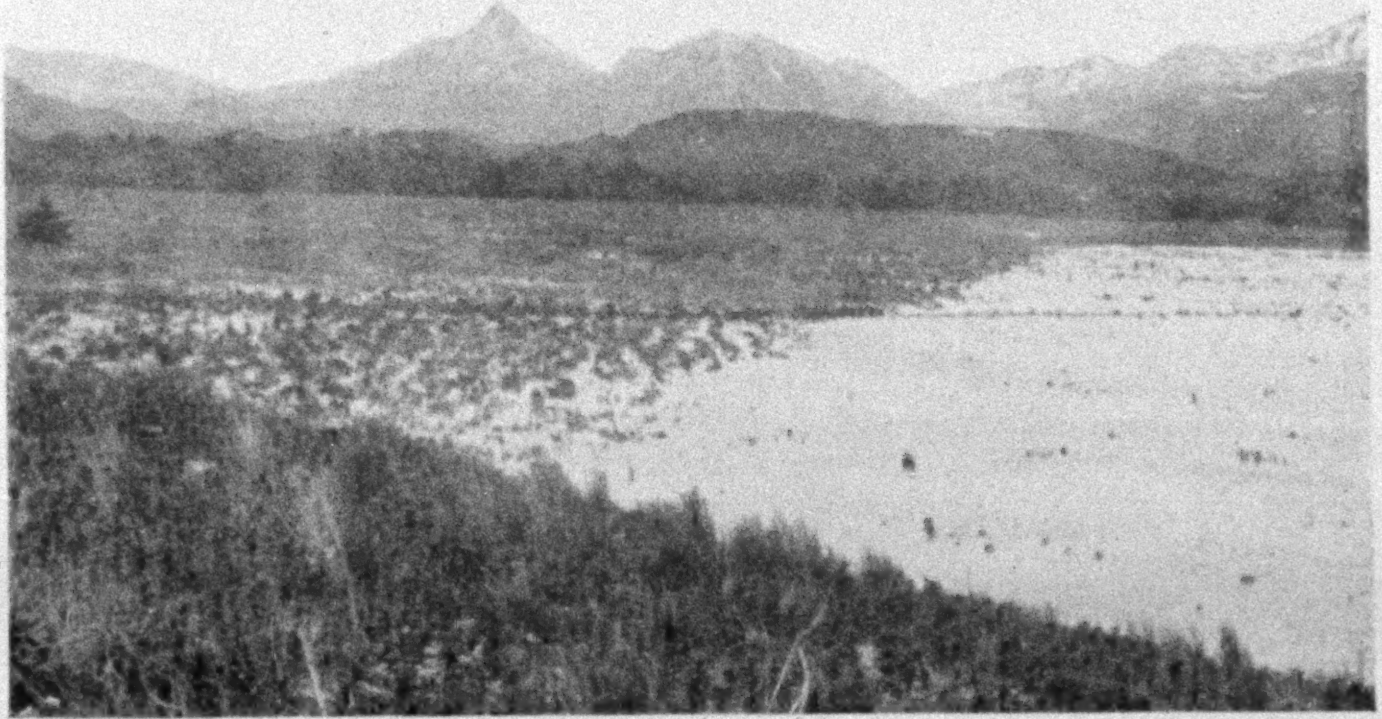
Places which three years ago were sand plains, with hardly a green leaf, have now come up into luxuriant meadows of blue-top grass. In some places the grass is still in scattered bunches, but in others it covers the whole ground in pure stands six or seven feet high. Where the meadows are completely grown up, the grass is finer than ever before (see page 18).

Of the berries, the most important is the salmon or "Molina" berry (*Rubus spectabilis*), which is allied to our blackberries and raspberries, but somewhat intermediate between them, having much the shape and appearance of a blackberry, but coming loose from the receptacle like a raspberry.

Salmon-berries were of course common before the eruption, but the ash provided such greatly improved conditions for them that the plants have made unusually vigorous growth (see page 24).

The ash also smothered and weeded out the smaller plants which formerly competed with the berries and apparently acts somewhat like a mulch, protecting the soil from excessive evaporation, for the berries did not suffer in the unprecedented drouth of 1915 as they are said to have done in less dry seasons before the eruption.

But although the country is in places clothed with vegetation as richly as be-



Photograph by D. B. Church

A PLOWED FIELD, PART OF WHICH WAS CULTIVATED JUST BEFORE THE ERUPTION

The line between cultivated and fallow ground remains perfectly distinct after four years. Cultivation just before the eruption destroyed most of the weeds and no new ones have been able to start. The uncultivated land has grown a mass of fireweed, whose bloom is conspicuous for miles—illustrating the importance of residual vegetation.

fore, it must not be supposed that the old order of things has completely returned. The new vegetation is not altogether the same as that which was destroyed. It is true that the species are the same as those dominant before the eruption, but the smaller species which formerly grew with the dominant plants were unable to pierce the ash blanket and were smothered. This is particularly true in the bogs or tundras, which formerly covered considerable areas. Even four or five inches of the ash was fatal to the bog plants, whose extermination was so nearly complete that it is difficult to find even individual survivors.

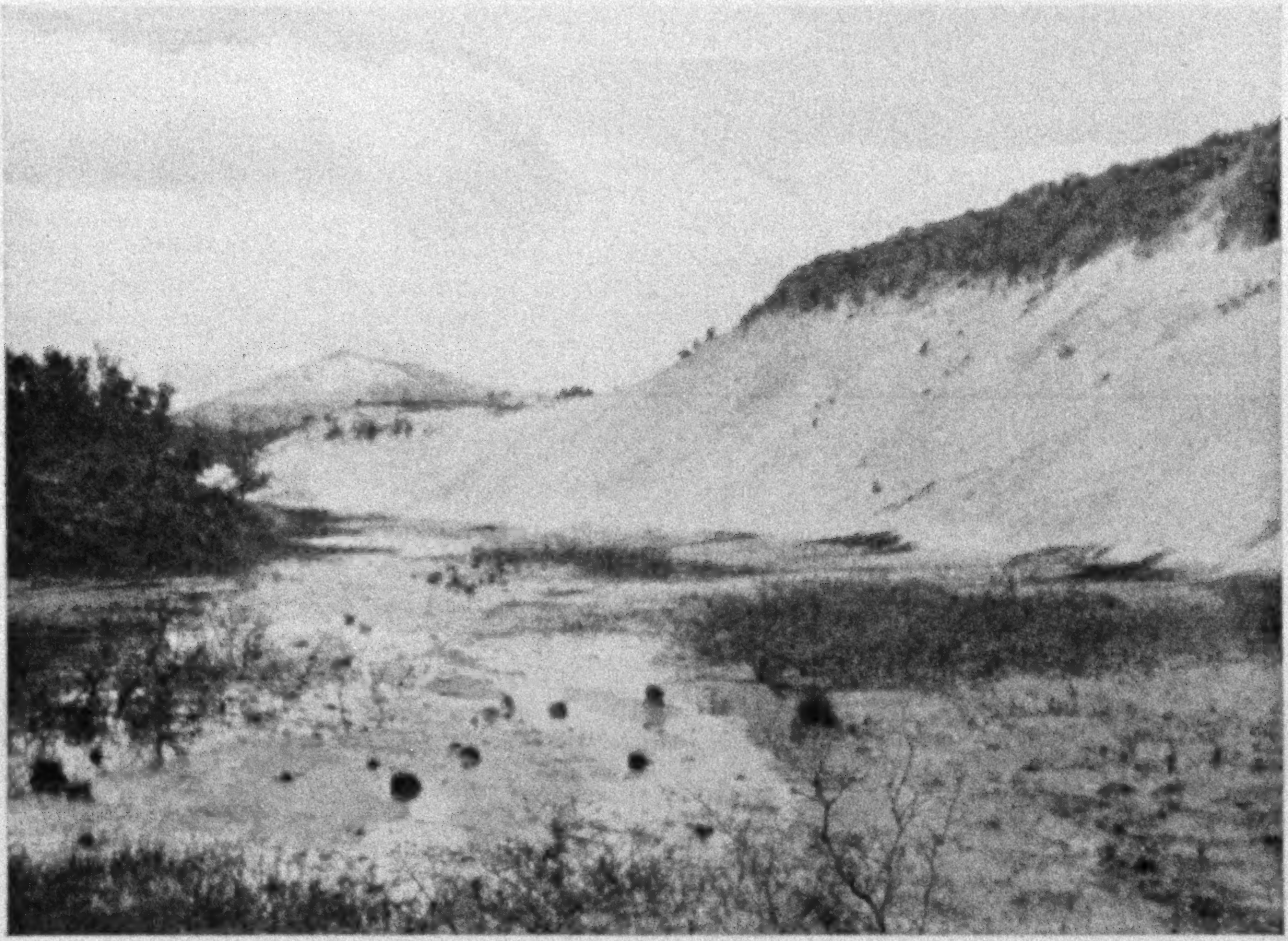
Thus while the salmon-berries and high-bush blueberries are finer than ever, the low-bush blueberries and cranberries are entirely lacking.

The exposed mountain tops were formerly covered with an alpine heath containing many of the same species that grew in the bogs, and to them the eruption was similarly fatal. While the sides of the mountains are covered with verdure, their tops are largely barren wastes covered with ash drifts and the skeletons of the former vegetation.

THE NEW VEGETATION CAME FROM OLD ROOTS

One would have supposed from the appearance of the country at the end of the first season after the eruption that practically all plants except the trees and bushes had been destroyed, and that revegetation must be due to new seedlings started on the ash. Such, however, is not the case. Excavation of the root systems of the new plants shows that they are old perennials which have come through the ash from the old soil.

Where cultivation destroyed the weeds, the land is still absolutely bare except for an occasional weed which escaped destruction by the plow. The fallow ground, on the other hand, is a mass of fireweed whose bloom is conspicuous for miles (see the picture above).



Photograph by D. B. Church

A DUNE OF WIND-BLOWN ASH: WOMEN'S PENINSULA, NEAR KODIAK

This blowing ash lodges behind any obstruction, like snow. Among the weeds at the edge of cultivated fields and along the fence rows drifts two feet deep have been formed. On mountain tops and in other places where there is no vegetation to catch the blowing ash it forms dunes like those on a seashore.

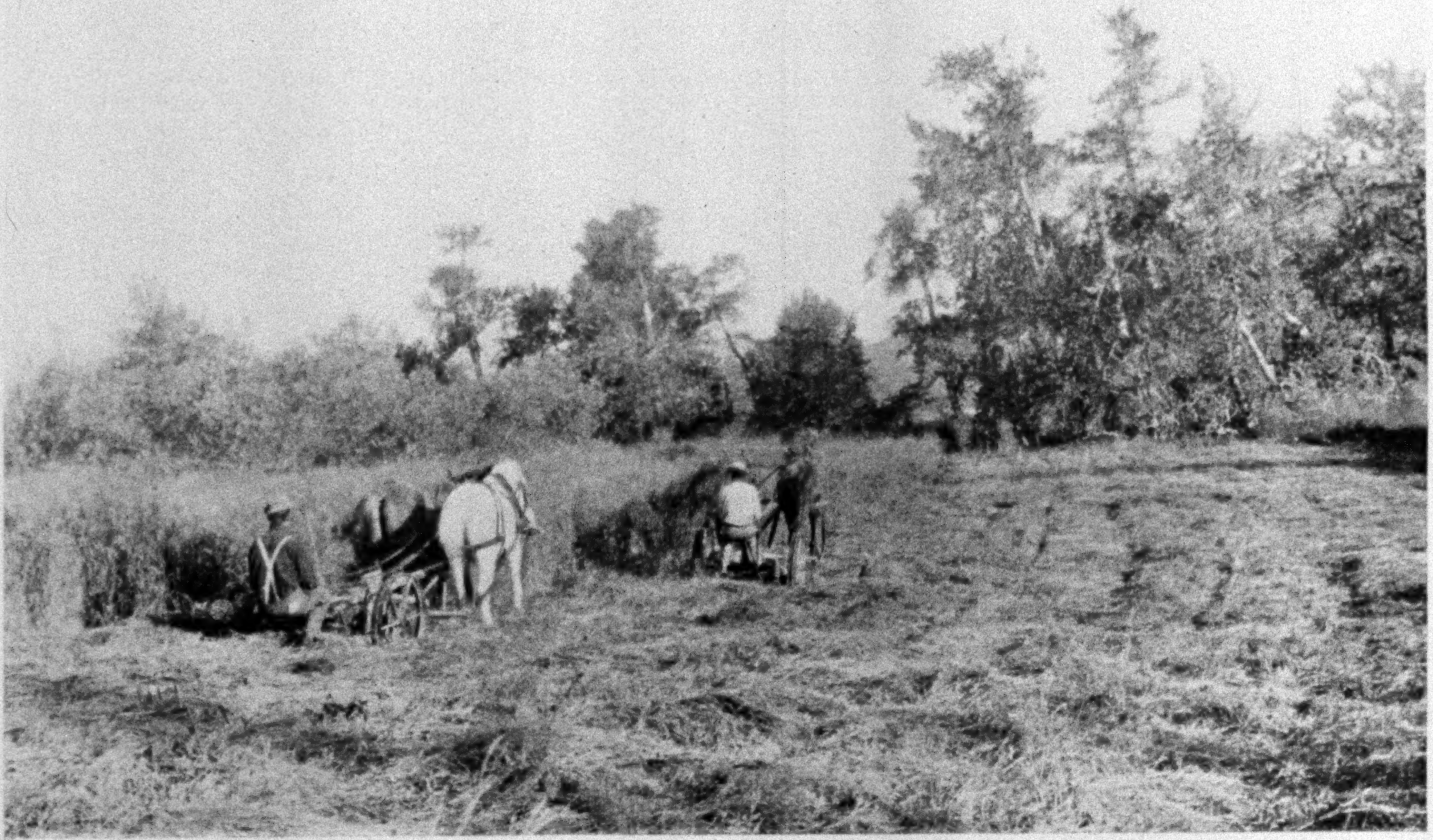
THE SAND BLAST

While these weeds protect the surface of the fallow ground, ash from the bare surface is picked up in clouds by every wind, forming a sand blast which is very hard on the few plants that have persisted. All of them are lopped over before the wind, and their lower leaves are cut to pieces by the sharp sand or are buried beneath it.

The particles of ash are all very sharp, sharper than ordinary sand. Indeed, volcanic ash forms the basis of such scouring agents as "Old Dutch Cleanser." The ash is also finer and much lighter than shore sand, so that it is more easily carried by the wind. Consequently this sand blast is a very different thing from the sand drift common among beach dunes. Standing before it is like facing a blast of "Old Dutch Cleanser" in one's face and is at times exceedingly unpleasant (see also page 27).

One might suppose that the frequent rains which characterize the climate of the region would have the effect of checking the sand blast, but it is surprising how quickly it starts up again after the rain stops. We found once, for example, after a day of soaking rain, that the sand was blowing early the next morning, although only the very surface had dried off.

It was of the utmost importance for the welfare of the country that the ground be covered with vegetation, regardless of the value of the plants making the cover. Of all the native plants, the one which could grow through the deepest ash and, once through, could spread most rapidly on the bare surface was the field horsetail (*Equisetum arvense*). This is a common weed of railway embankments and such places with us. In Kodiak scattered individuals were frequent before the eruption, though they formed no noticeable element in the landscape. But it has come up everywhere through



Photograph by D. B. Church

CUTTING NATIVE BLUE-TOP HAY NEAR KODIAK (SEE ALSO PAGE 13)

This hay comes up through the ash, which, in much of this land, was washed off the hills, covering the bottoms a foot and a half deep

Photograph by R. F. Griggs

BRINGING IN HAY FOR THE EXPERIMENT STATION AT KODIAK

"Were the title not preempted, Kodiak might have been called the 'Emerald Isle' quite as well as Ireland. Its situation in the Pacific is indeed very similar to that of Ireland in the Atlantic, for it owes its climate, as does Ireland, to the tropical ocean current which bathes its shores" (see text, page 13).

the ash and spread out on the surface, forming in many places a beautiful greensward, where hardly anything else can come through.

Its present abundance contrasts so greatly with its former state that, according to Mr. Snodgrass of the Experiment Station, some of the natives thought that it must have "come with the ash," and could only be convinced of the contrary when he dug out the rootstocks and showed that they originated in the old soil beneath the ash. While a deposit of 10 or 12 inches would have been fatal to most plants, the horsetail in many places came through from 30 to 36 inches of ash.

CONTRAST BETWEEN KODIAK AND THE MAINLAND

Nothing could offer greater contrast to the rehabilitation of Kodiak than the condition of the country on the mainland near the volcano. The village of Katmai, which was the nearest settlement affected, is in an altogether different state from Kodiak. While Kodiak is rejoicing in the prospect of a prosperity beyond that of former days, Katmai is sinking deeper into desolation.

In fear of their lives, the people of Kodiak deserted their town for a few days; but the natives of Katmai, who, fortunately, were away fishing at the time of the eruption, were never allowed to return to their homes, but were removed in a body and settled in a new town built for them by the government. The grass has returned to cover the hillsides of Kodiak as richly as ever before, but the former luxuriance of Katmai Valley is replaced by a barren waste, whose few spots of green serve only to heighten the weird effect.

OUR TRIP TO THE MAINLAND

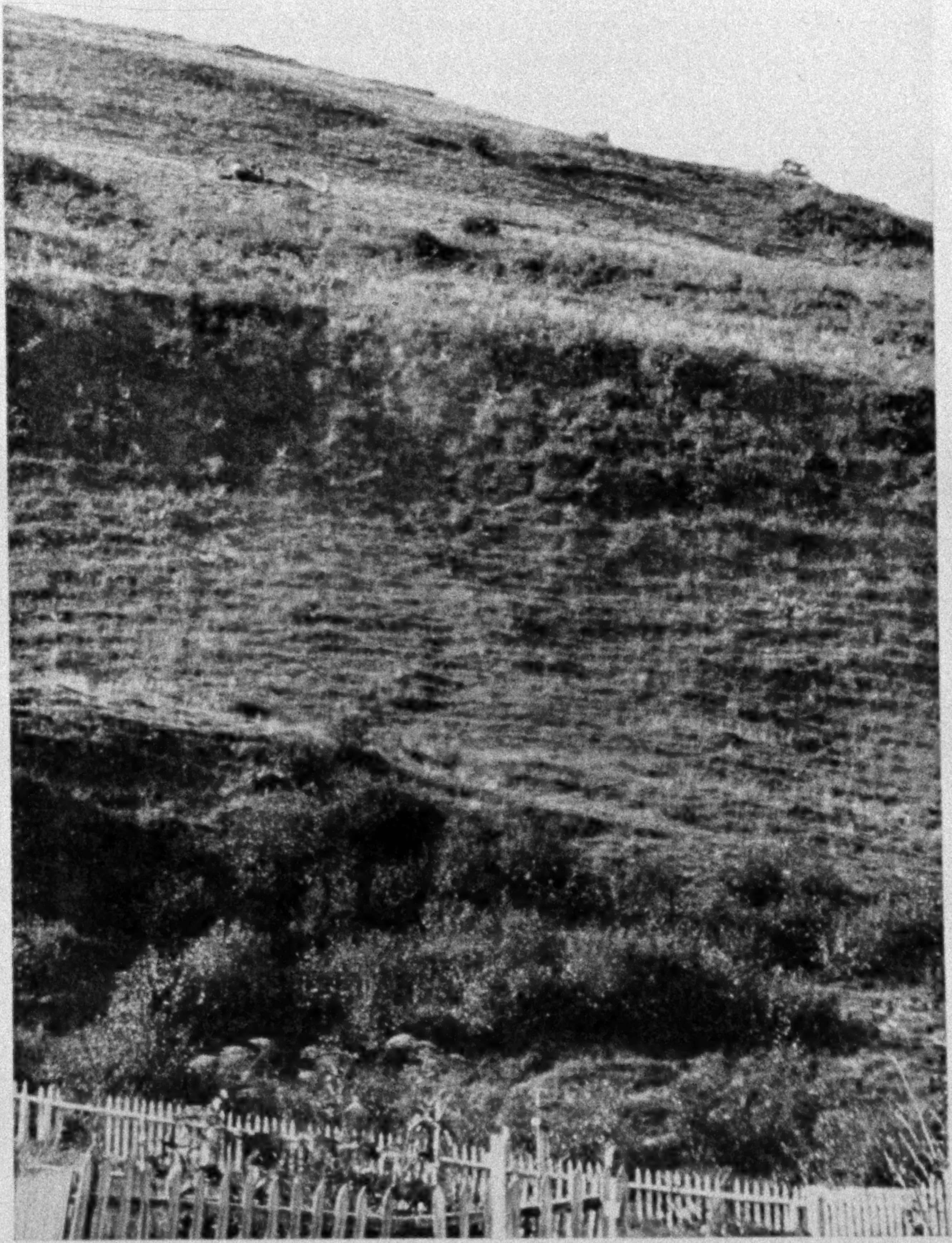
It is not to be supposed that Katmai village was at all near the crater, however. Situated at a distance of 25 miles, it was five times as far from the volcano as was Pompeii from Vesuvius or St. Pierre from Mt. Pelee. More important still, Katmai village was not in the main track of destruction, but lay at one side, near the edge of the ash fall.

To make the trip to Katmai, we secured the services of Mr. Albert Johnson, of Uyak, who undertook to land us at Katmai and come and take us off again when we had finished our exploration. Mr. Johnson proved himself not only trustworthy, but a first-class seaman and a man of very good judgment as well, all of which qualities are essential in one who would successfully navigate the dangerous waters of Shelikof Strait, which lies between Kodiak Island and the mainland, for it has justly acquired the reputation of being one of the most treacherous pieces of water in the world. There were three of us in the party: Mr. B. B. Fulton, Entomologist of the New York Experiment Station, who accompanied me throughout the summer, a most efficient and loyal assistant, and Mr. Lucius G. Folsom, manual-training teacher of Wood Island, near Kodiak, who by his resourcefulness and never-failing optimism helped to carry the expedition by many an obstacle which might otherwise have turned us back.

A WEIRD, FANTASTIC SCENE

The scene which met our eyes as we entered Katmai Bay was fantastic and weird in the extreme. Quantities of fresh pumice were floating about as though thrown out by a recent eruption. The sun was shining brightly, but the sky was filled with haze from the volcanic dust in the air, which increased the ghastly and mysterious appearance of the desert landscape and veiled the upper reaches of the valley and the volcanoes we hoped to visit.

As soon as we landed, we began to see evidences of the great flood, which was to be the source of much concern to us. The flats were everywhere covered ankle deep with soft, sticky mud. We were unable to find any place to pitch our camp between the precipitous mountain sides and the flooded flats, except a mound of avalanche detritus, which we felt was too dangerous, for boulders and small avalanches were rolling down the mountain sides all around us every few minutes. We finally reached a bed of pumice which had been floated into place in a grove of poplars. Although there was very wet mud only a few inches below it, the surface was fairly dry. We were in con-



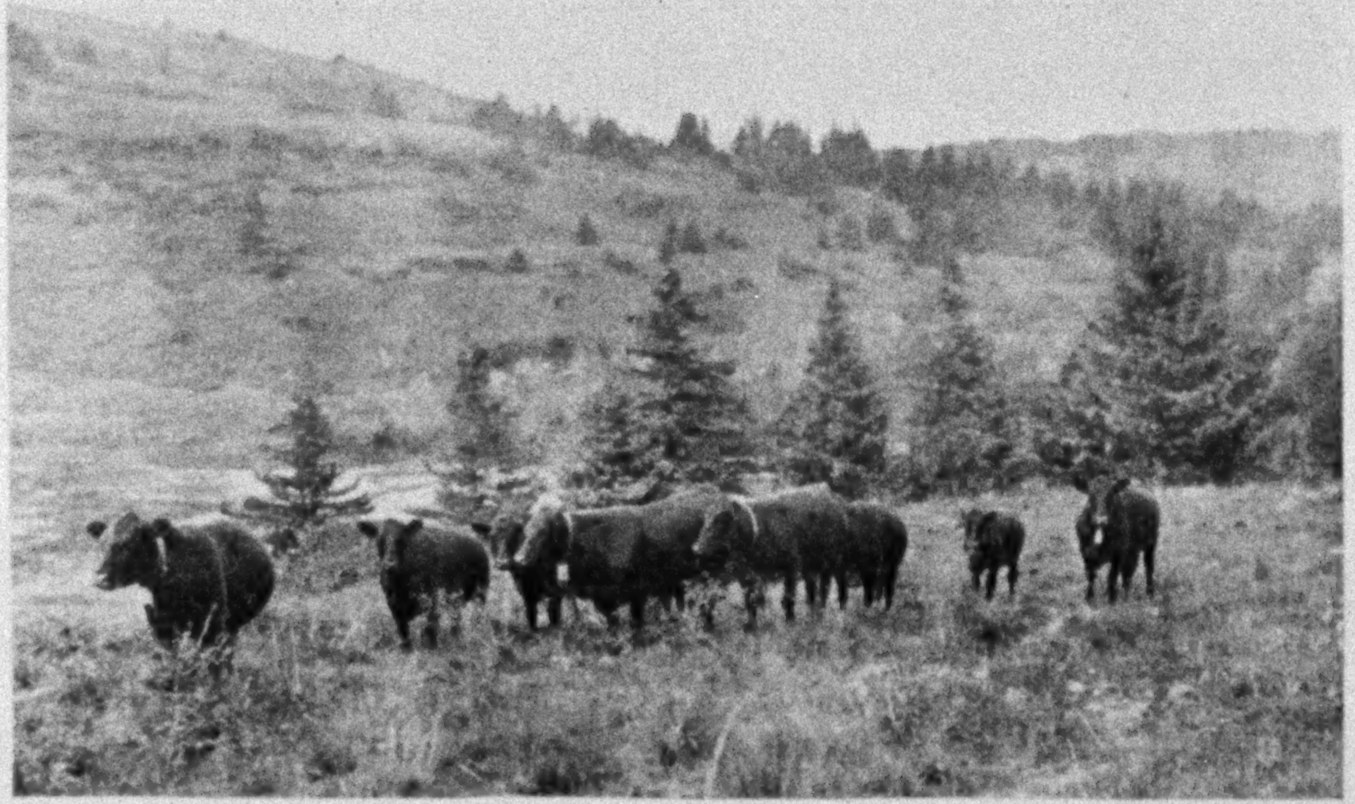
Photograph by R. F. Griggs

ROLLING HAY DOWN THE MOUNTAIN SIDE AT KODIAK

The native method of harvesting hay is certainly one of the most curious bits of agricultural practice to be found anywhere. The hay is cut high up on the mountain side, done up into bundles in fish nets, and sent tumbling end over end to the bottom, there to be picked up and carried home, oftentimes in boats.

SHEEP FOR STOCKING A SETTLER'S RANCH BEING LANDED ON KODIAK ISLAND

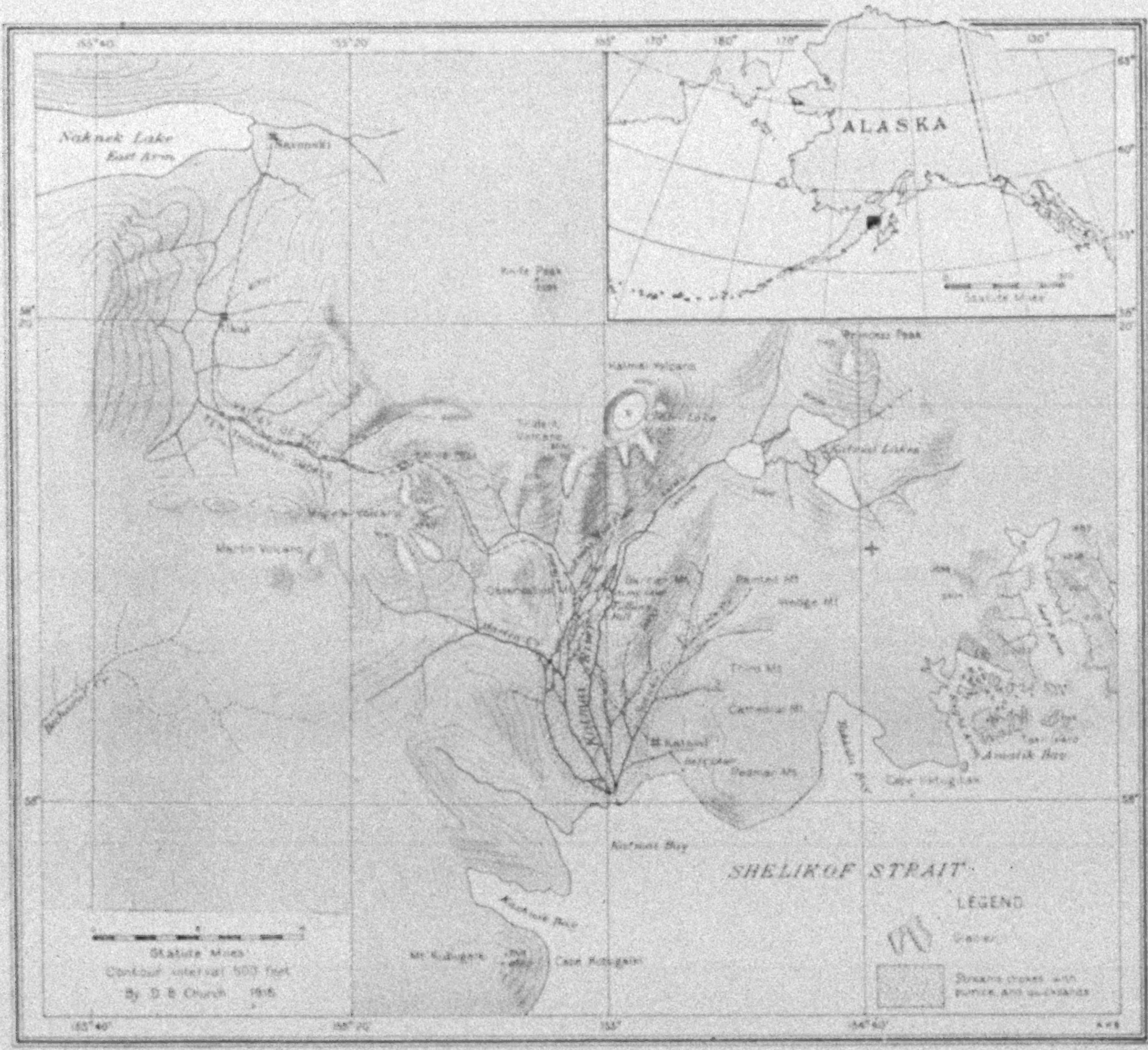
At present this country is lying almost neglected, but as Alaska passes from the stage of exploitation to that of development, these lands are destined to be much sought after for stock-raising.



Photographs by R. F. Griggs

SLEEK GALLOWAY CATTLE BELONGING TO THE EXPERIMENT STATION AT KODIAK

After the eruption the station herd had to be taken to "the States" for the first two years; but their pastures made such a remarkable recovery that they were soon returned. A stranger would hardly suspect that this country was buried under a foot of ash only four years ago.


Naknek Lake
East Arm
ALASKA
Statute Miles
Katmai Volcano
Martin Volcano
Kukak Bay
Katmai Bay
Amalik Bay
Cape Kubugakli
Mt Kubugakli
SHELIKOF STRAIT
LEGEND
Glaciers
Statute Miles
Contour interval 500 feet
By D. B. Church 1916
155°40'
155°20'
155°
154°40'
58°20'
58°

SKETCH MAP OF KATMAI VOLCANO AND VICINITY

stant fear, however, that the water would suddenly rise in the night and drive us out.

The desolation of the country beggars description. All of the trees had perished except such as were favored by some special circumstance, such as proximity to the protecting mountain sides. In one way the trees and bushes suffered more seriously than the herbage, for wherever the ground had been swept bare of ash the old roots of the herbage sent up new shoots, so that in a few fortunate spots flowers were blooming in their pristine profusion.

But where the ash remained to the depth of a foot or more, the ground under the dead trees was absolutely bare. No vegetation had come through cracks, as at Kodiak, and indeed such cracks may not have been formed because the deposit here is much coarser grained.

Under the mountain sides, where a few remnants of the forest remained alive, different species had suffered in different ways. The only large trees were the balsam poplars. All of the growing parts and ordinary buds of these had been killed, but some of the dormant buds, buried deep in the bark, had survived and grown out into short, bushy branches which gave the trees a most bizarre appearance.

The alder, which is the most characteristic Alaskan bush, everywhere was simply exterminated. For our purposes this was somewhat fortunate, for it was easy to break our way through the branches of the dead thickets, which otherwise would have made traveling difficult. Not a single live sprig of alder was seen until after we had explored considerable country, and then only two or three very small

Photograph by M. G. Dickman

A BRANCH OF SALMON-BERRIES, INDICATING THE PROFUSION OF WILD BERRIES AT KODIAK SINCE THE ERUPTION

These berries are somewhat like the persimmon, in that they have an astringent taste that disappears only when they are dead ripe. They have, however, a distinctive and extremely delicate flavor, and when served with sugar and cream equal or surpass any other berry with which the author is acquainted.

shoots were seen coming up from the roots.

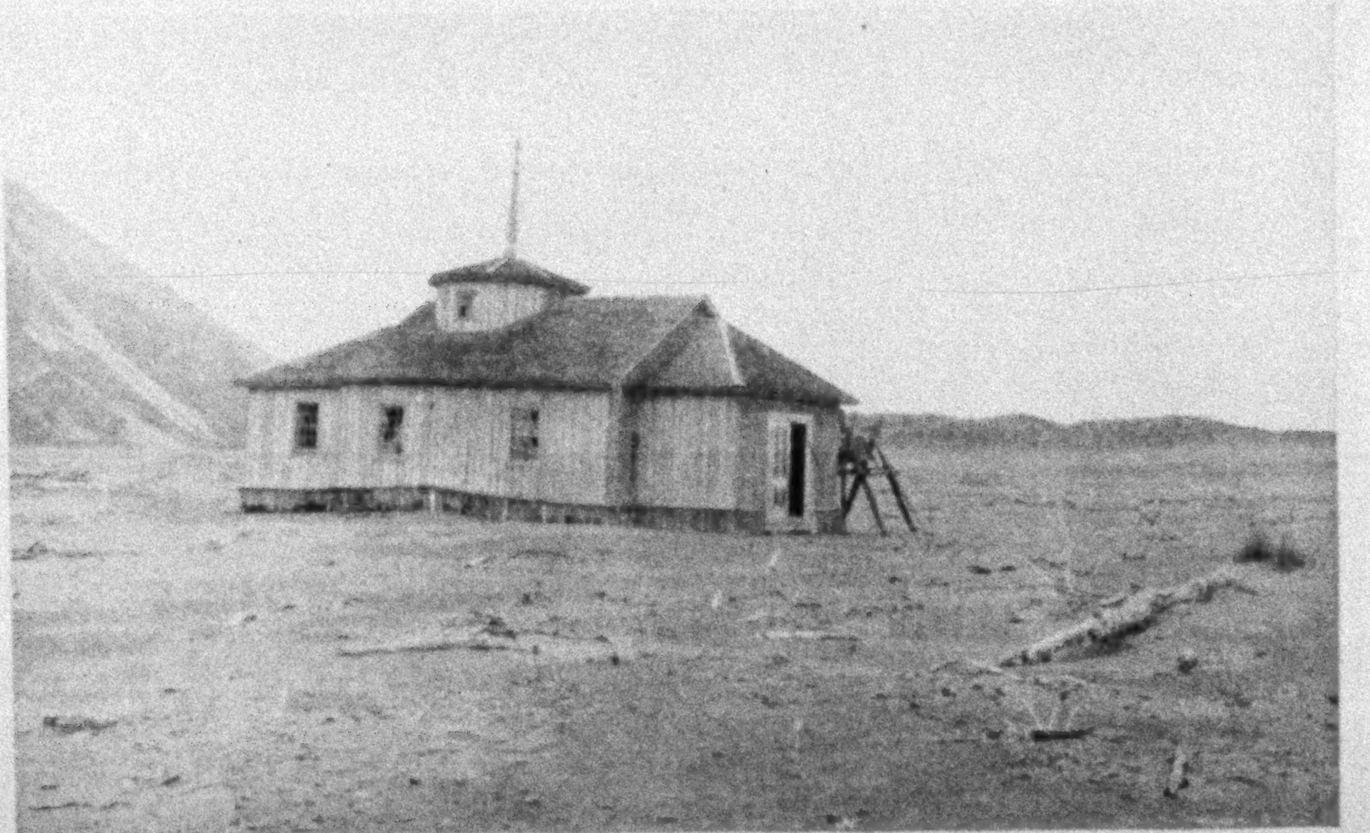
When we arrived at the village, the magnitude of the flood was impressed on us as it could not be in the brush-covered dunes. The church where the people had worshiped undisturbed for years was standing in a sea of liquid mud. The high-water mark could be plainly seen across the front about five feet and a half from the ground.

Some of the native houses were filled solid full to the eaves with pumice. Some had been completely submerged, as might be seen by the stranded pumice which had floated onto their roofs. The roof of one had been floated away from the body of the house and lay at a little distance. The church had evidently floated free from its foundation, for the high-water marks across it were somewhat diagonal (see opposite page).

A RIVER FIVE MILES WIDE AND FIVE INCHES DEEP

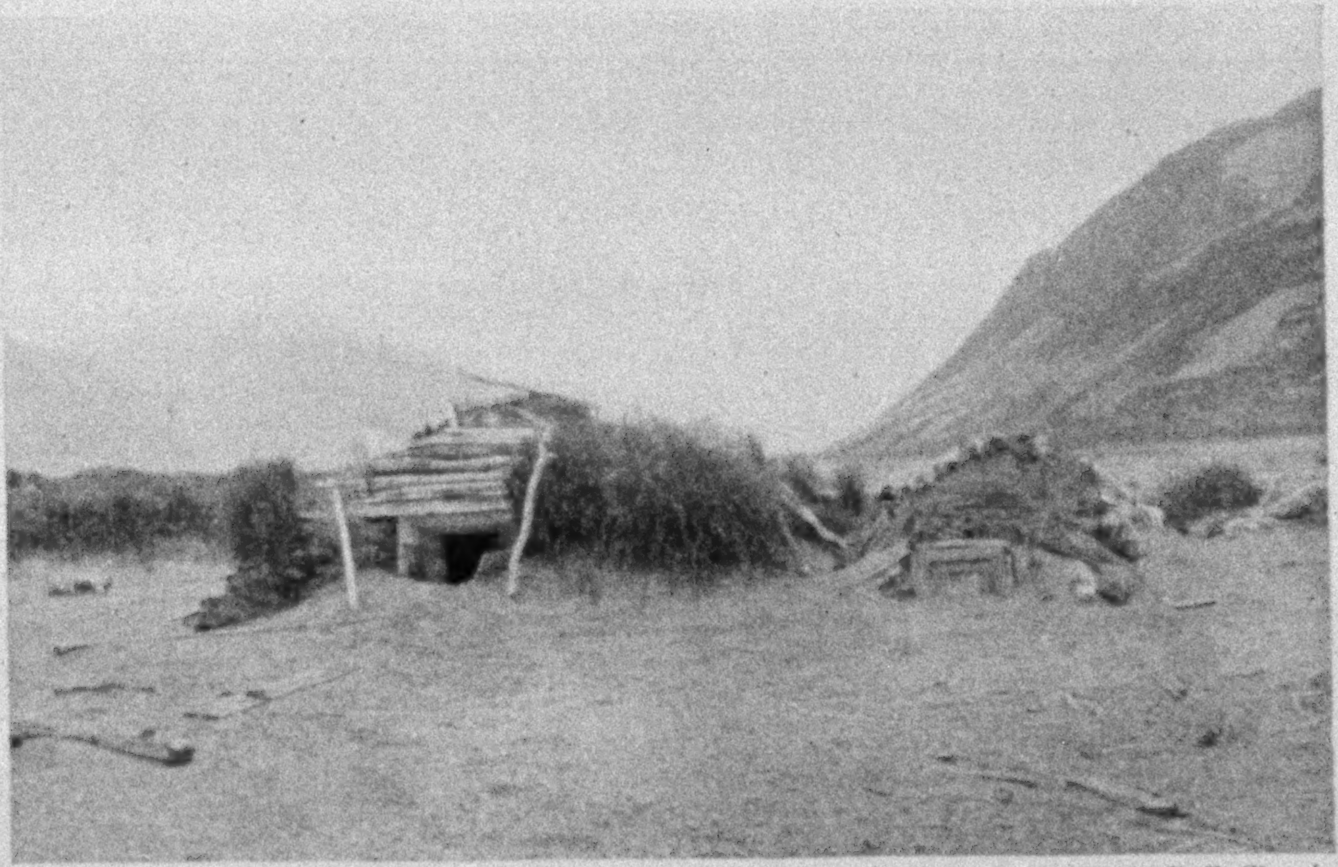
The river, whose former bed was close by the houses, had subsided from the flood condition enough to show its character. Where formerly was deep water was now a maze of quicksands and intertwining streams. So much material had been dumped into it that the level of its bottom was several feet above its former channel. We could see no indication of the farther bank. Somewhere out beyond the range of our vision were one or more main channels in which a formidable volume of water was running, as we later found to our cost. But except for these shifting main channels it could be described as five miles wide and five inches deep.

We ventured far out from shore to see whether it would be possible to cross, but



THE GREEK CHURCH AT KATMAI VILLAGE STANDING IN THE MUD AND WRECKAGE LEFT BY THE GREAT FLOOD

This part of Alaska is still "Russian America." Russian is the language of the common people, and the Greek Church is the only religious institution.



Photographs by D. B. Church

A "BARABARA" BURIED BY THE PUMICE BROUGHT DOWN BY THE GREAT FLOOD: KATMAI VILLAGE

These huts, comparable to the sod-houses of the plains, are well adapted to afford protection from the intense gales of winter

Photograph by R. F. Griggs

A FOX CUB DRINKING CONDENSED MILK: KODIAK

Foxes are abundant in this region, and it was not intended to establish a precedent by feeding this one condensed milk, especially during these days of the high cost of living. Other foxes must continue to "rustle their own grub."

soon found ourselves miring in the quicksands, so that we were glad to hurry back to terra firma.

The condition of this river is undoubtedly the most serious obstacle to the exploration of the district. While the bottom is too treacherous to travel afoot, especially under a pack, the greater part of it could be easily traversed with snowshoes or some similar contrivance, which, however, would be a fatal encumbrance in the swift currents of the deeper channels. A boat might be used were it not for the fact that the current is too strong for rowing, the bottom is too uncertain for poling, and there is no place to land.

MYSTERIOUS SOURCE OF FLOOD

Conditions at the village greatly increased our respect for the magnitude of the flood, but failed to enlighten us as to its cause. The volume of water had been tremendous, considering the size of the watershed, for although the main stream is less than forty miles long and has a steep gradient through much of its course, the water had filled the whole valley, six miles wide, many feet deep. We knew of no general storm which could have caused any such unusual quantity of rain.

Our first thought was that the spring tides, which had just passed, had overwhelmed the land; but a little examination showed that the high water had been far above any tide-mark. We then thought of volcanic rains up the valley, for we had no knowledge of the condition of the volcanoes.

But the examination of the village was reassuring in one respect: Although there could be no doubt but that the flood had culminated only a day or two before our landing, everything indicated that it was a very exceptional event.

EXPLORING IN A DUST-STORM

When we awoke the next morning we found that a westerly gale which had started during the night had picked up the fine dust from the mountains until it

Photograph by R. F. Griggs

LANDING ON KATMAI BEACH

Only in perfectly calm weather can the landing be undertaken, the water being normally very rough

had changed the haze of previous days into a terrific dust-storm. The dust was so thick that it obliterated everything beyond the immediate vicinity. It permeated everything about our camp. We were extremely worried lest it should get into our cameras and ruin all our films.

It matted our hair so that we could not comb it for days. The sharp particles caused acute discomfort in our eyes, and at first we were afraid that it might do us permanent injury; but after a time the irritation stimulated an increased flow from the tear glands, which helped to keep the eyes washed out.

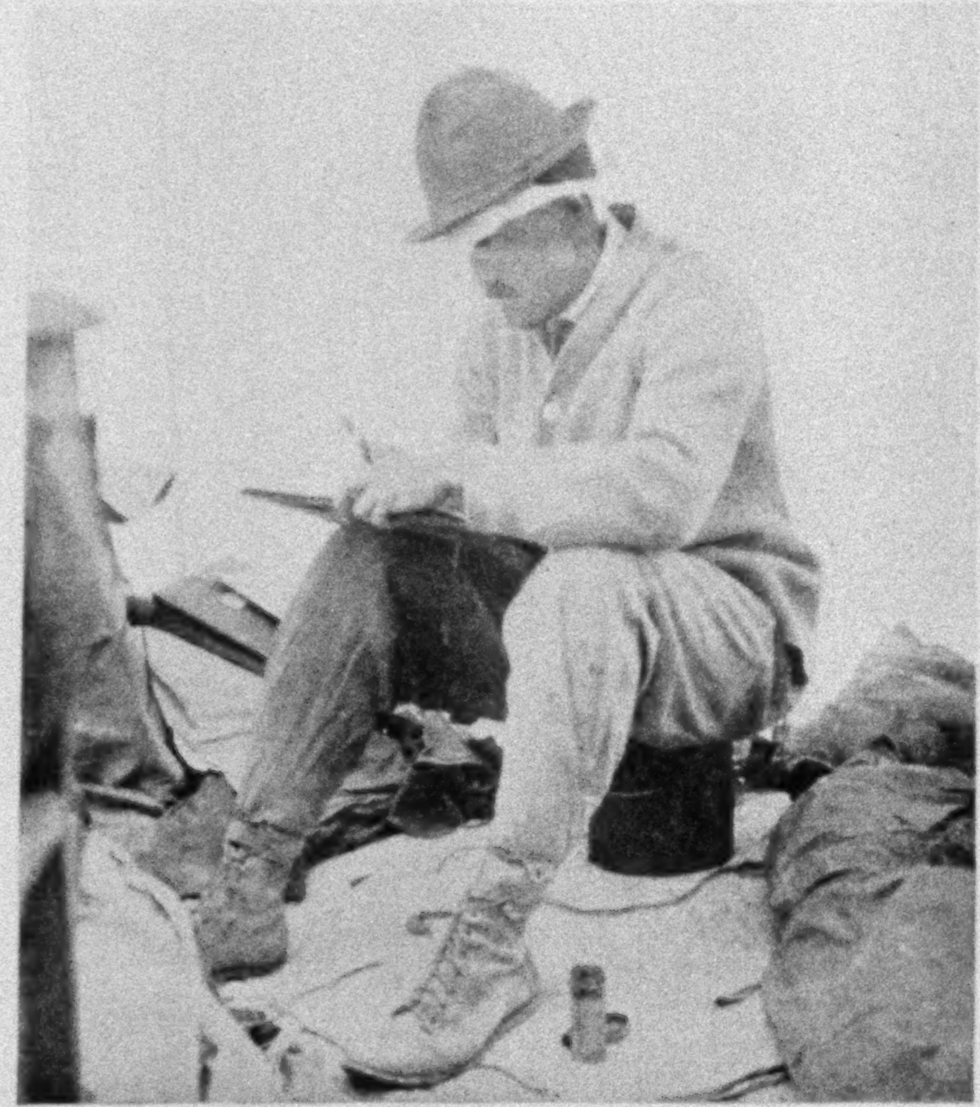
During this day of dust-storm we explored the valley as far as Soluka Creek. The dust heightened the already weird character of the landscape, giving it an indescribably unearthly appearance. The effect was much like that of a heavy snowstorm. This was increased by the outlines of the bare trees. Indeed, so keen were the visual sensations of a snowstorm that every little while I would realize with a start of surprise that I was not cold (see also page 17).

About noon we fell to speculating on the state of the weather above the dust-storm and were surprised on searching the sky at being able to find the sun, whose disc was just visible, a pale white, something like the moon in daytime, but fainter.

It would be quite impossible adequately to describe our feelings on this day, as we groped our way forward into new country, utterly different from any we had ever seen before. Fortunately the loose sandy surface of the ash everywhere held our tracks, so that even without our compass we could hardly have become lost.

FOLLOWING A BEAR TRAIL

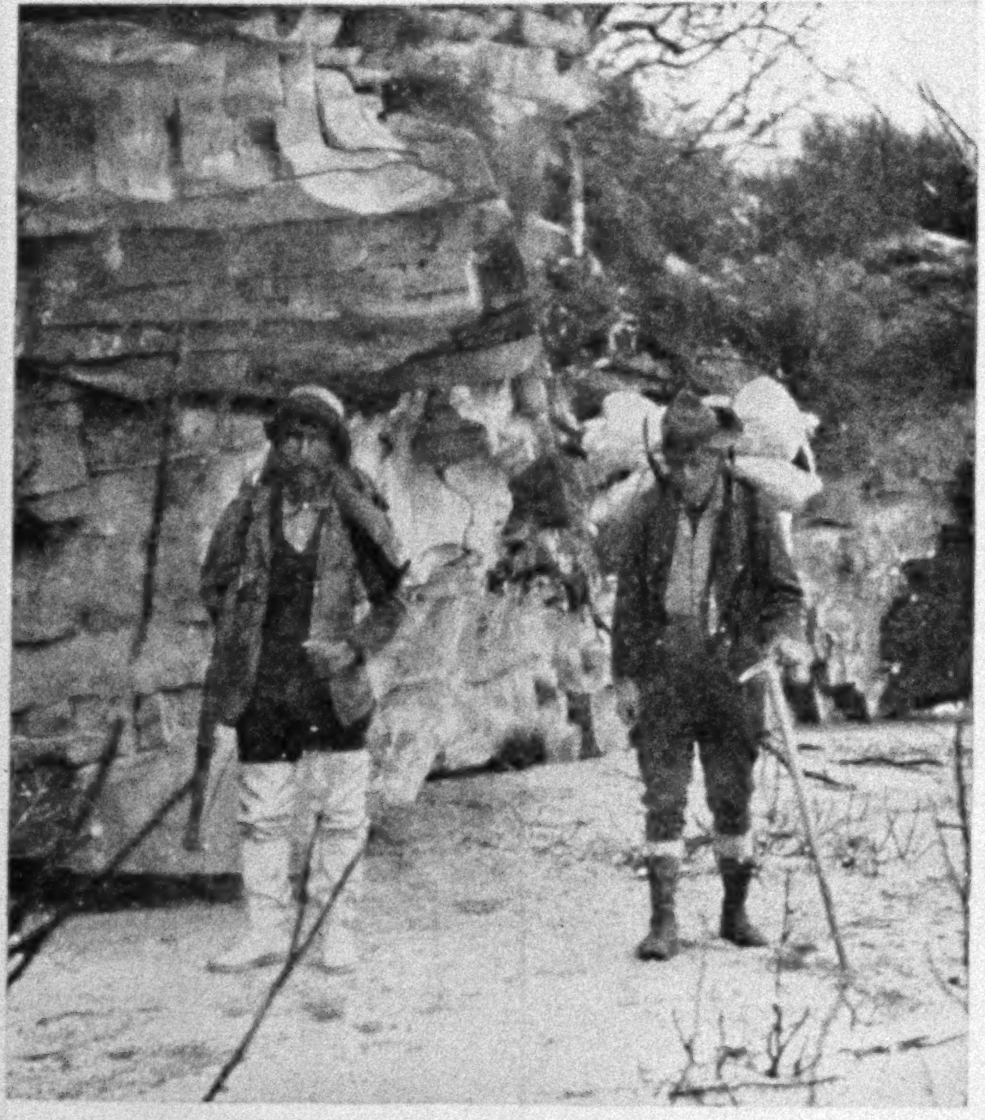
We followed all the way a well-worn bear trail which skirted the foot of the mountain, finding that the bears had selected the easiest going to be had. It was very noticeable that the bear trails, except for an occasional side branch into the mountains, all ran lengthwise up and down the valley. They had made no attempt to cross the river. Apparently



Photograph by D. B. Church

WRITING IN THE TENT DURING THE SAND-STORM

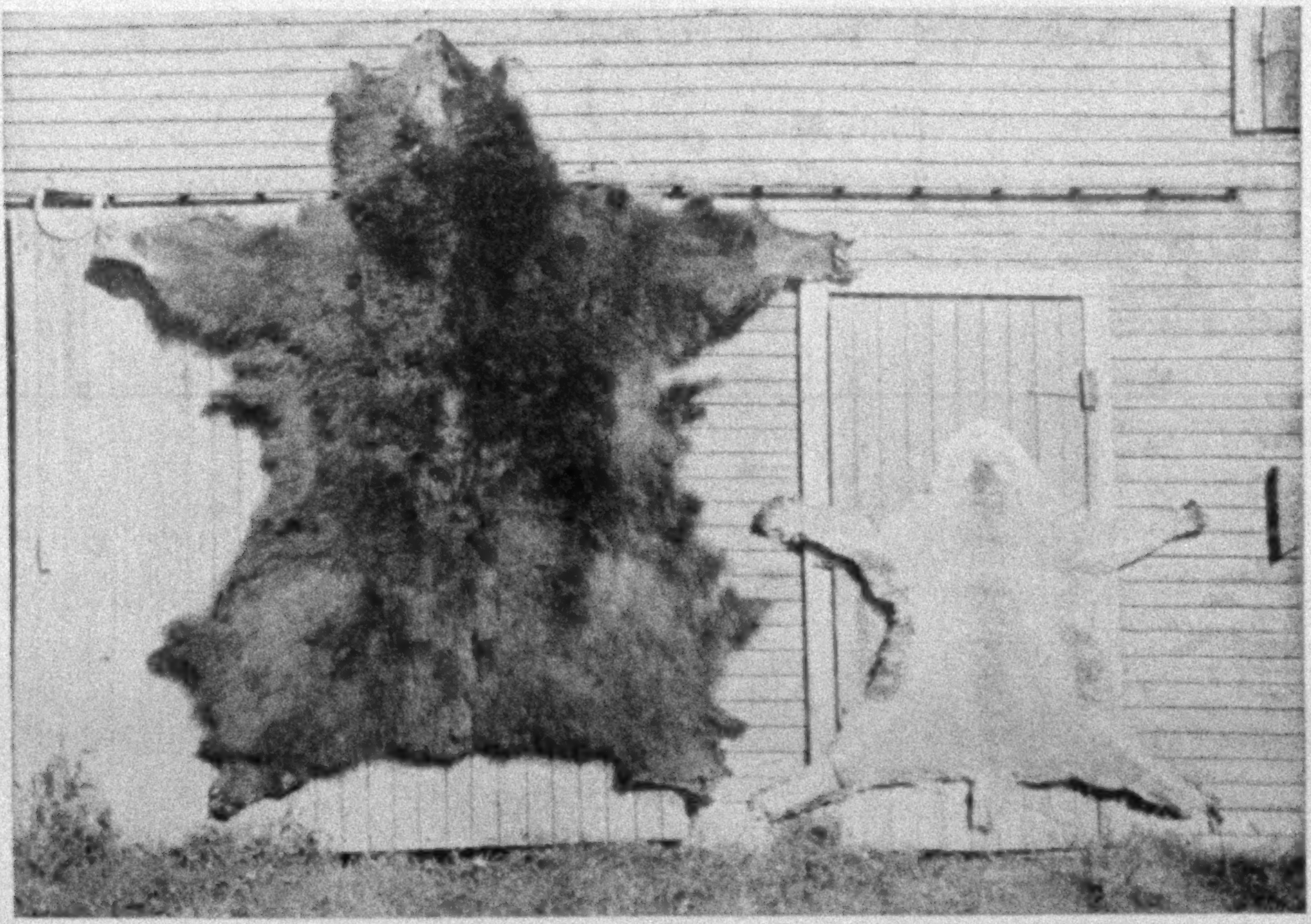
While outside a piece of pumice lodged in my eye with such force that it had to be dug out with forceps, causing considerable discomfort for a couple of days (see page 26).



Photograph by L. G. Folsom

CHURCH AND WALTER ON THE TRAIL

The bears of this region are only slightly inferior in size to the Kodiak bear, the largest carnivorous animal in the world, and the members of the expedition, following a well-worn bear trail, feared meeting one. After several days on this trail without encountering anything but tracks, they began to fear lest they should *not* see one.



Photograph by R. F. Griggs

A KODIAK BEAR SKIN

Although by no means a large skin, as Kodiak bears go, comparison with the mountain-lion skin to the right shows how much larger the bear is than the panther

they had learned by experience not to try that.

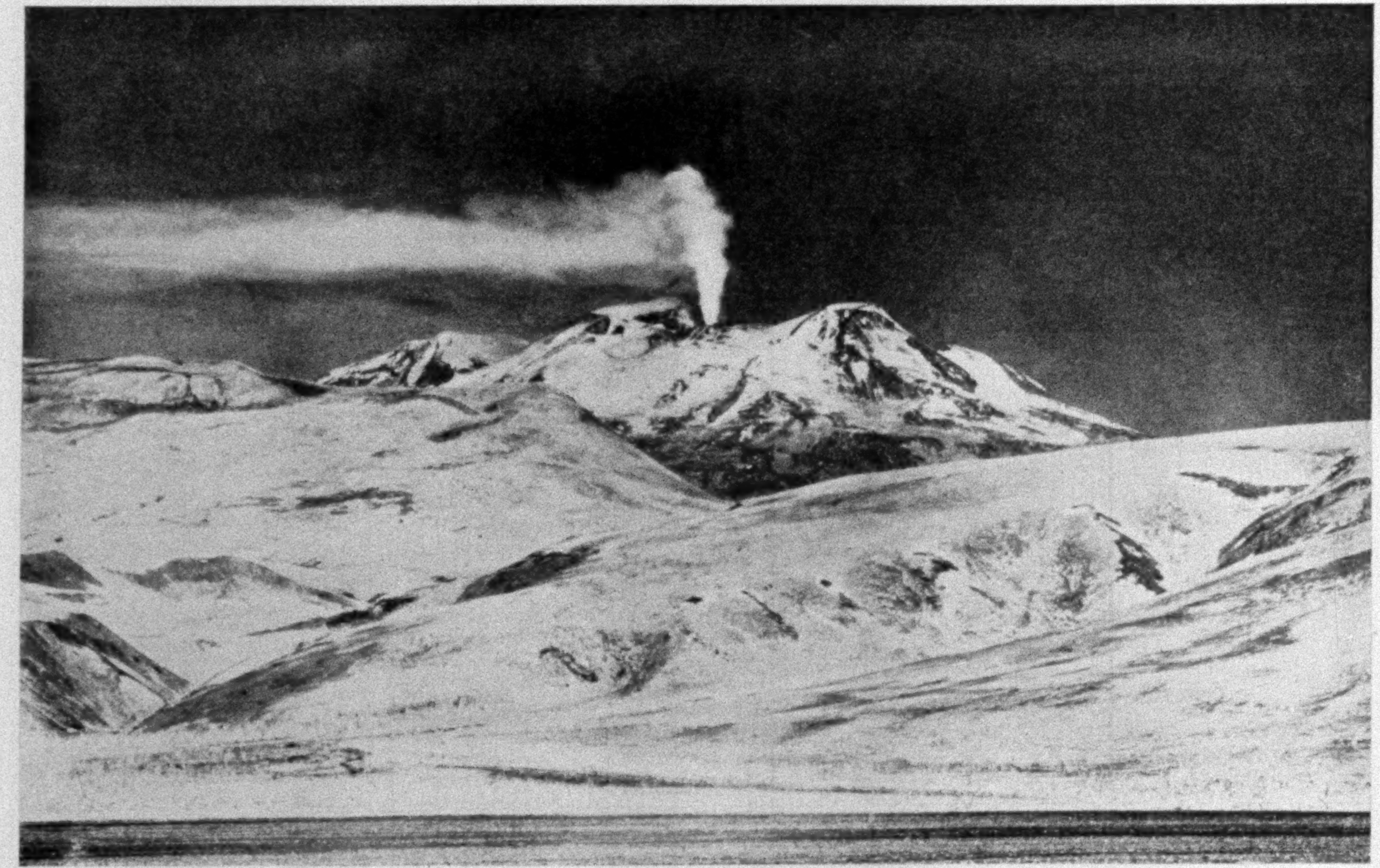
Everywhere we kept a sharp lookout for bears, but, although we found a great many tracks belonging to at least a half-dozen sizes of bears, we did not see any of them. At first we were rather concerned for fear that we should come upon one suddenly, for in such a barren country we could not but believe that they must be hungry, and in any event a she bear with cubs is an ugly customer to settle with on short notice. The bears of this region are only slightly inferior in size to the Kodiak bear, which is the largest carnivorous animal in the world, so large as to make a full-grown grizzly look like a cub by comparison.

Later, after we had traveled many days without seeing one, we began to be as much concerned for fear we should not see a bear as we had been at first for fear we should.

They doubtless saw us many times, but were shy and kept out of our way. Indeed, once we thought a mother and cubs who had been advancing toward us had turned and retreated on our approach, for we found where their tracks, apparently just made, suddenly reversed and turned up the valley. We often found on returning over one of our trails that a bear out of curiosity had tracked us for some distance, and when we saw beside our own footprints enormous bear tracks measuring nine by fourteen inches we could not avoid having somewhat of a creepy feeling. Some of the bear tracks were so clear that we could see the marks of the creases in their soles, and had we been palmists doubtless we could have read the fortune of the possessor or at least have learned his disposition.

OTHER SIGNS OF ANIMAL LIFE

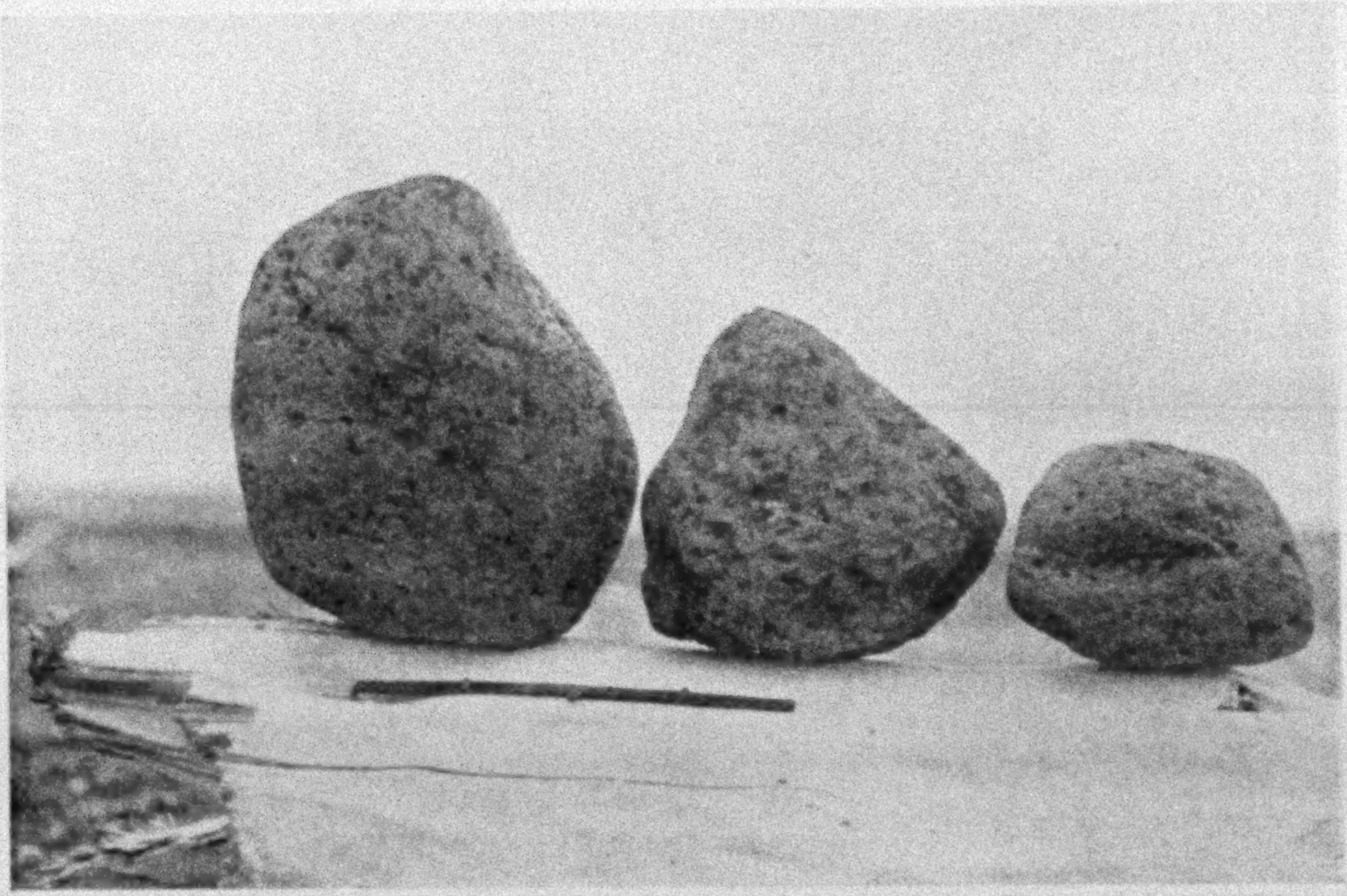
Besides bears, foxes were very abundant, and we could frequently get their scent as we traveled along. Wolverines were also frequent travelers along the trails we used. One of the latter must have passed close beside us one day as we climbed a mountain, for we found his



Photograph by D. B. Church

MOUNT MAGEIK FROM THE UPPER VALLEY

"Standing square across the head of the valley, we saw Mount Mageik, its magnificent three-peaked snow-cap brilliant in the sunshine. From a small crater east of the central peak issued a column of steam, which, although clearly visible for fifty miles out to sea, appeared diminutive in comparison to the bulk of the mountain" (see text, page 33).



Photograph by R. F. Griggs

FLOATING ROCK—LUMPS OF PUMICE PICKED UP ON THE BEACH: KATMAI BAY

The foot rule gives the scale. The violence of the explosion was so great that all the pumice was blown to small bits. There were few pieces more than six inches in diameter from Mount Katmai. These came from one of the subordinate vents in the Valley of the Ten Thousand Smokes.

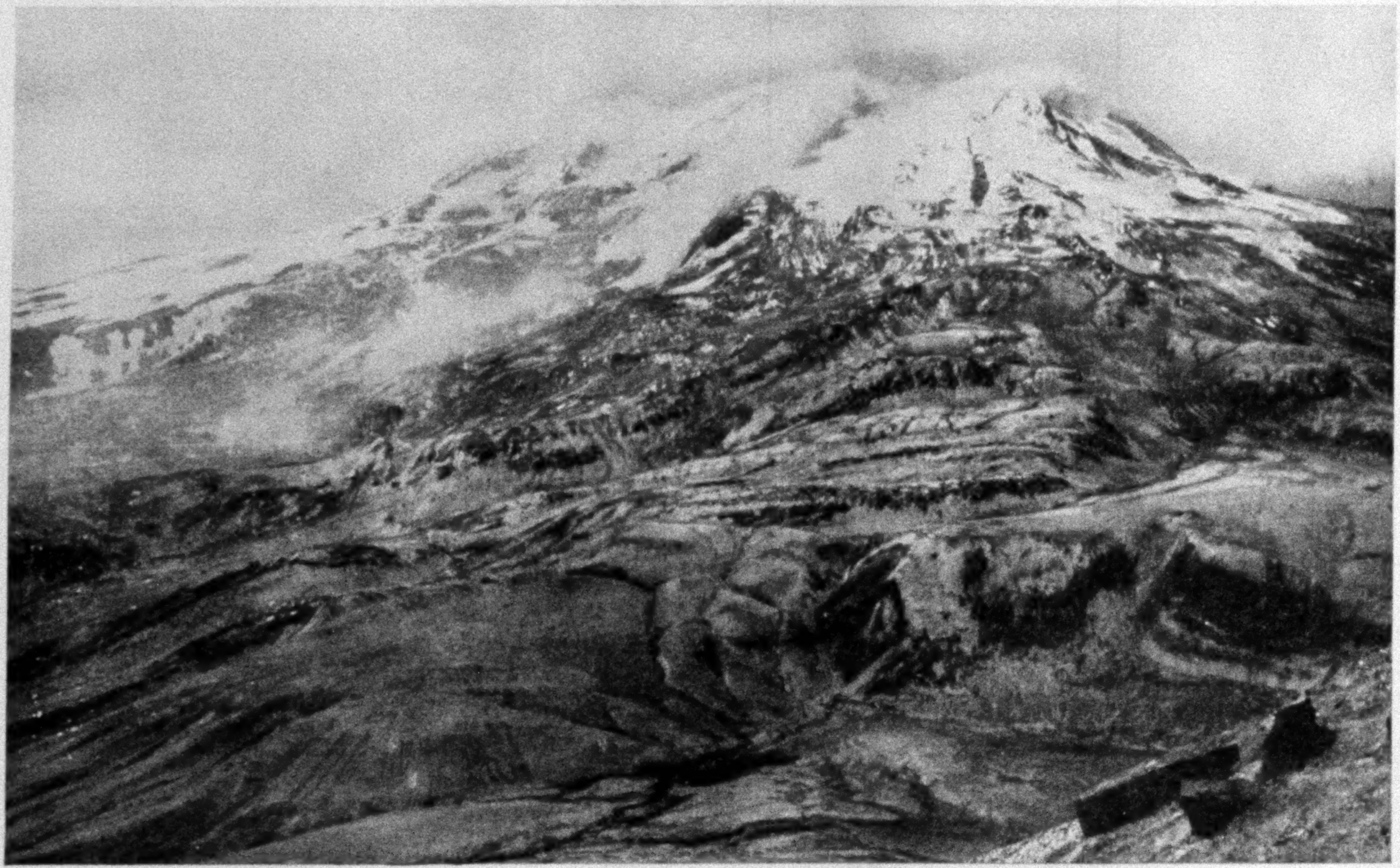
fresh tracks on the pass at the top, and on returning followed his trail across our own. How he managed to hide from us in a country so destitute of cover is not clear, but probably he had ample notice of our approach and secreted himself somewhere behind a rock. Of the smaller mammals we saw not a sign, although the surface of the ash preserves tracks to a remarkable degree.

We were surprised to find a few small fish like minnows in the river, for with the ash fall all the streams were entirely filled up for a time, and even the river must have been nearly choked. There was no evidence, however, anywhere of salmon, which must have formerly entered the river in large numbers.

The means of subsistence of so many large animals was very much of a mystery to us; yet they must have found something to eat, for they were evidently at home and not merely passing through. Moreover, if they had not found food they could easily have migrated, for a journey of 20 miles to the westward would have taken them into a country rich in berries, mice, ground-squirrels, and marmots, besides large game such as caribou, and, most important of all, in the summer, salmon in the streams. The only evidence we could secure in this matter beyond our own conjectures was obtained from the character of the bear droppings, which much resembled horse dung, as though the animals had been living on grass. The quantity of grass obtainable, however, seemed entirely inadequate to feed even one bear.

FIRST VIEW OF THE VOLCANOES

On the 16th, having previously broken the trail as far as Soluka Creek, we packed up our outfit and as much food as we could carry and started up the valley for the volcanoes. Our remaining provisions, together with everything not essential to our work, were left in the base camp. Although we had made things as snug as we could, it was not without considerable trepidation that we turned our back on our supplies; for in



Photograph by D. B. Church

MOUNT MAGEIK FROM OBSERVATION MOUNTAIN

A cap of thin clouds persistently clung to the summit, so that we could not get a clear view. The great mass of the mountain is well brought out in this picture. The ash conceals its glaciers, of which there are several.

such a desert country we were absolutely dependent on our provisions, and if a bear or wolverine should take it into his head to wreck our camp in our absence we should have been in a bad way.

Three or four miles up the valley we came out into the open, where we could see the distant mountains of the main range. Standing square across the head of the valley stood Mount Mageik, its magnificent three-peaked snow-cap brilliant in the sunshine. From a small crater east of the central peak issued a column of steam, which, although clearly visible for 50 miles out to sea, appeared diminutive in comparison with the bulk of the mountain (see page 30).

Mount Katmai itself was concealed beyond the bend of the valley, so that we were to have no glimpse of it until we encamped at its foot.

A NEW VOLCANO NAMED FOR DR. MARTIN

But to the west of Mageik, in a position where no volcano is indicated on the maps, was rising from a comparatively low mountain a tremendous column of steam a thousand feet in diameter and more than a mile high.

Comparison with Horner's picture showed at once that this was the mountain he photographed as "Mt. Katmai," when he penetrated to the upper valley in 1913. It was clear enough from its location that it could not be the mountain called Katmai on the maps, which is east of Mageik. Even from our position it was evident that this was at present the most active volcano of the district.

And it was not at all certain but that this, rather than Katmai, had been the seat of the great eruption whose effects we were studying; for, curiously enough, there has never been any very positive evidence, beyond the statements of a few natives who saw the beginning of the eruption, that it was Katmai, rather than some other volcano in the vicinity, which exploded. Indeed, there was one well-informed man in Kodiak who assured us that he had climbed the mountains back of Amalik Bay and taken bearings which fixed the location of the vent nearer the coast, in a position which he indicated by a cross on my chart (see map, page 23).

Fortunately we were able later to obtain evidence which fixed the seat of the great eruption beyond question. In the first place, we found that the deposits became progressively deeper as we approached Mt. Katmai, while the volcano of Hesse and Horner's photographs was near the edge of the ash fall. Thus the deposits on the lower slopes of Katmai are 15 feet deep on the level; but 10 miles farther south, near the other volcano, their depth is to be measured by as many inches, and only a mile or two beyond the country is covered with vegetation, so rapidly do the deposits thin out in that direction.

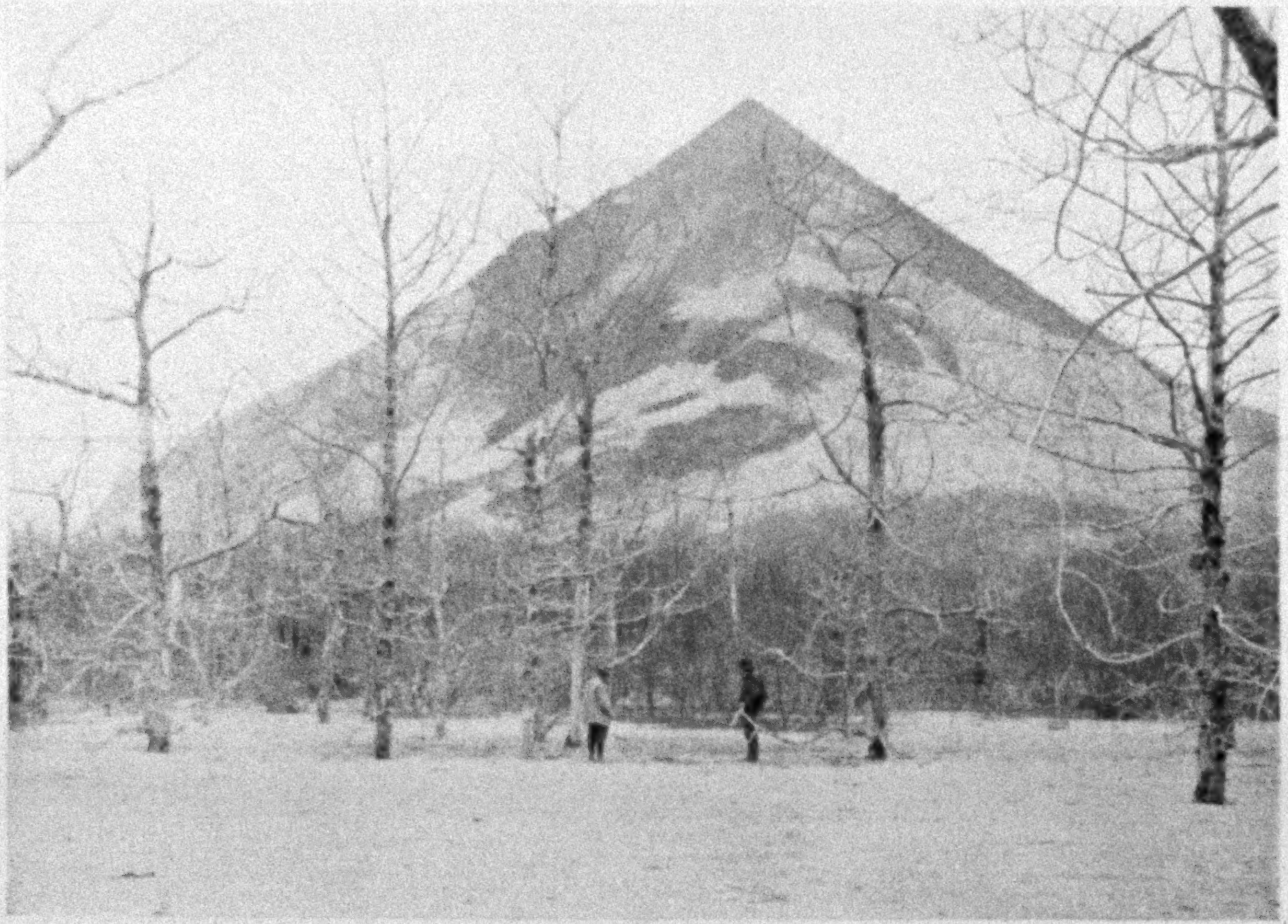
Moreover, great as is the activity of this volcano, its crater, in comparison with the great caldera, which we later found in Mount Katmai, is relatively diminutive and quite too small to have thrown out such a tremendous quantity of ash and pumice in so short a time. Further, great as must have been the changes wrought in the landscape in the sudden opening of a vent a thousand feet in diameter, they were relatively insignificant beside the tremendous change we found in Mount Katmai itself. There can be no question therefore that the eruption was from Mount Katmai and not from any other vent.

But if we were convinced that the volcano of Hesse and Horner's photographs was not Katmai, we were equally uncertain of what it was, for none of the maps show any volcano near its location nor give any name to the mountain, and there appears to be neither record nor tradition of any volcano in that quarter.

There is every reason to believe, therefore, that this new volcano sprung into being at the time of the great explosion.

But tremendous as is the phenomenon of the opening of such a gigantic vent through a mountain, we were to find later other accompaniments of the great eruption of even greater magnitude.

In order to discuss the new volcano, it is necessary to give it some designation. It seemed to us as we watched the new "steamer" that no name could be more appropriate than one commemorating the work of Dr. George C. Martin, whose explorations and report for the National



Photograph by D. B. Church

A CAMP SITE OF 1915: TREES ALL KILLED BY BLAST FROM THE VOLCANO

On our first expedition our camp stood on the bank of Fickle Creek, whose channel, six feet deep, occupied the foreground of the present picture. During the year the channel completely filled up, so evenly that the location of the former bank could not be detected, and a new channel has been dug a thousand feet away. Yet so gently was this filling accomplished that the embers of our camp-fire, on the same level and only a few feet away, were not disturbed. Compare the picture on the opposite page.

Geographic Society will always stand as the first authoritative account of the great eruption of Mount Katmai. We therefore suggest that this new volcano be called Mount Martin.

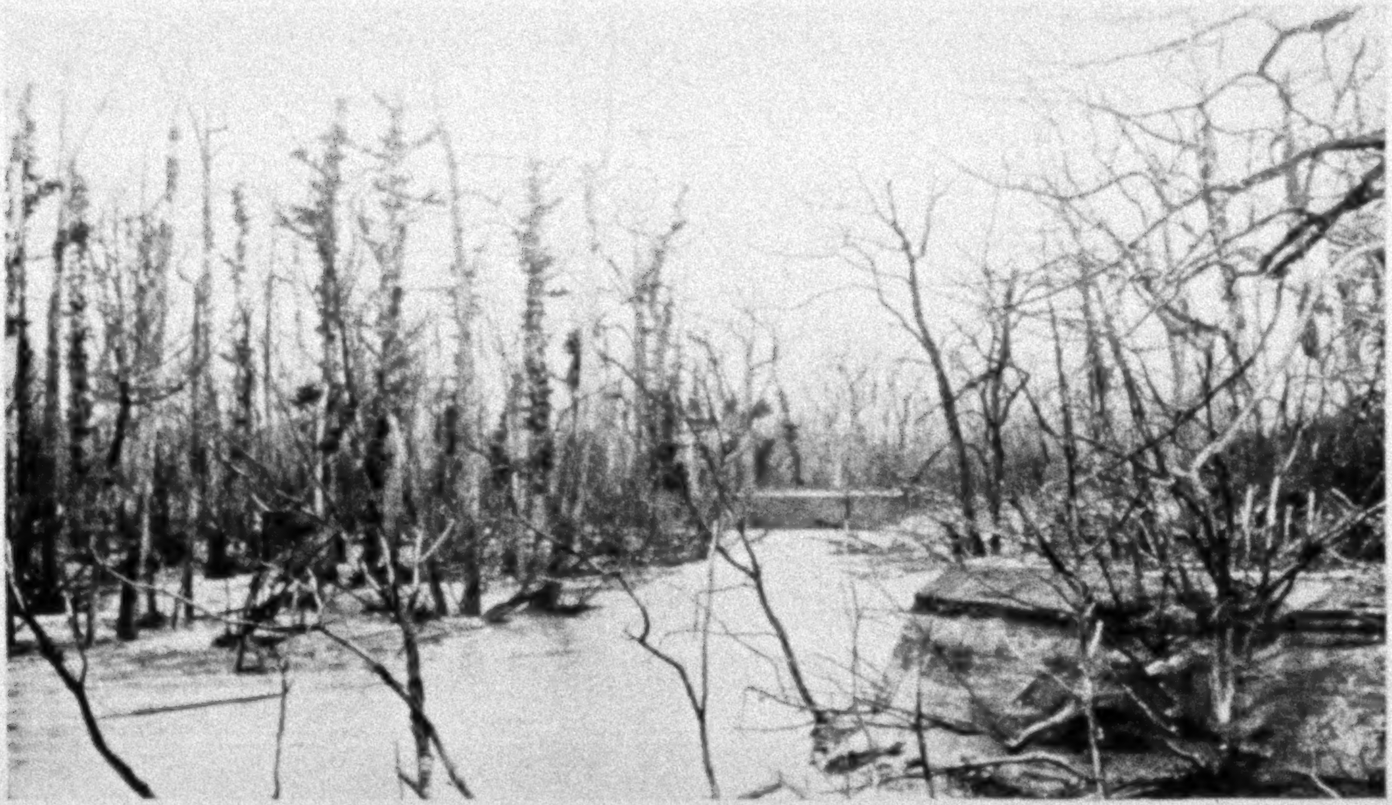
We were not able to determine the position or altitude of this new volcano with precision, but have located it approximately on the map given on page 23. Although situated in the main range, it is considerably lower than the neighboring mountains. Its altitude is approximately 5,000 feet.

ASH SLIDES MORE THAN A THOUSAND FEET HIGH

When we reached Soluka Creek we found it much more formidable than our reconnoiters in the dust storm had indicated. Leaving the others on the bank, I dropped my pack and waded out through the dead forest for half a mile in the icy water. From that distance it looked wider, deeper and swifter than from the starting point. I therefore decided it was impracticable to attempt to cross under our heavy packs, so we camped that night in the dead forest on the flat near by.

Next morning, starting to hunt for a practicable ford, we climbed up on to the shoulder of a mountain where we could get a bird's-eye view of the creek below and select the likeliest place to try.

Here we found a new experience in climbing the great ash slides with which the lower slopes are covered. Wherever the mountains were precipitous and too steep for the ash to stick, it slid down into the valleys, covering the lower slopes with great fans of sand, which stand at the critical angle ready to slide down at the slightest provocation. Some of these ash slopes are more than a thousand feet high. Their surface is loose, rolling sand,



Photograph by R. F. Griggs

THE BED OF FICKLE CREEK IN 1916: IT HAD SHIFTED A THOUSAND FEET IN THE YEAR

into which one sinks to his ankles, while new sand continually slides down on to him.

Often the whole slide above one will begin to move and then he is placed in a tread-mill, where he must keep moving or slide to the bottom (see page 37). Such climbing was of course hard work, and we soon cut up our finger-nails and wore the tips of our fingers down to the quick in the sharp sand by using our hands to help us in climbing.

FORDING A MILE OF QUICKSAND

When we descended to the ford we found that the bottom was a continuous quicksand clear across.

Sometimes the surface would hold like the crust of a snowdrift; but we were in constant fear of going down, for on sounding with our alpenstock we discovered that the whole length of the stick went down into the sand anywhere without finding bottom. Often our footing gave way and we found ourselves floundering up to our middle in quicksand.

With all our crossings in the two expeditions no one ever got in so deep that he could not get out alone. But there was the ever-present knowledge that we never touched the bottom and the fear of what might happen next time.

Besides this the labor of carrying a pack through such mire is so great as to defy description. It must be experienced to be appreciated. Every step takes all one's strength and soon one's weary muscles ache from the strain. But once in, there is no chance to rest until one reaches the farther shore, for there is no place to lie down or sit down, and if one even stands still he immediately begins to sink. Even the strongest man is well-nigh exhausted after a mile of such work.

The condition of streams choked with ash and pumice is peculiar in the extreme. They spread out over their whole floodplain, wandering this way and that through the dead forest in a most fantastic way, changing their courses continually, so that the stream is never the same for half an hour at a time. The whole bottom is rapidly traveling downstream, its continuous, steady motion resembling one of the moving platforms which are sometimes used to transport passengers.

One stream near our camp had cut clear through the accumulated mass of ash just below a fall, forming a bluff some 70 feet high. A hundred yards downstream, however, the slope, though still very steep, was less, and the stream had been completely overcome by the enormous quantity of pumice in its way.

It was ludicrous to watch the struggles

Photograph by R. F. Griggs

ASH SLIDES IN UPPER KATMAI VALLEY

"Wherever the mountains were precipitous and too steep for the ash to stick, it slid down into the valley, covering the lower slopes with great fans of sand" (see text, page 34)

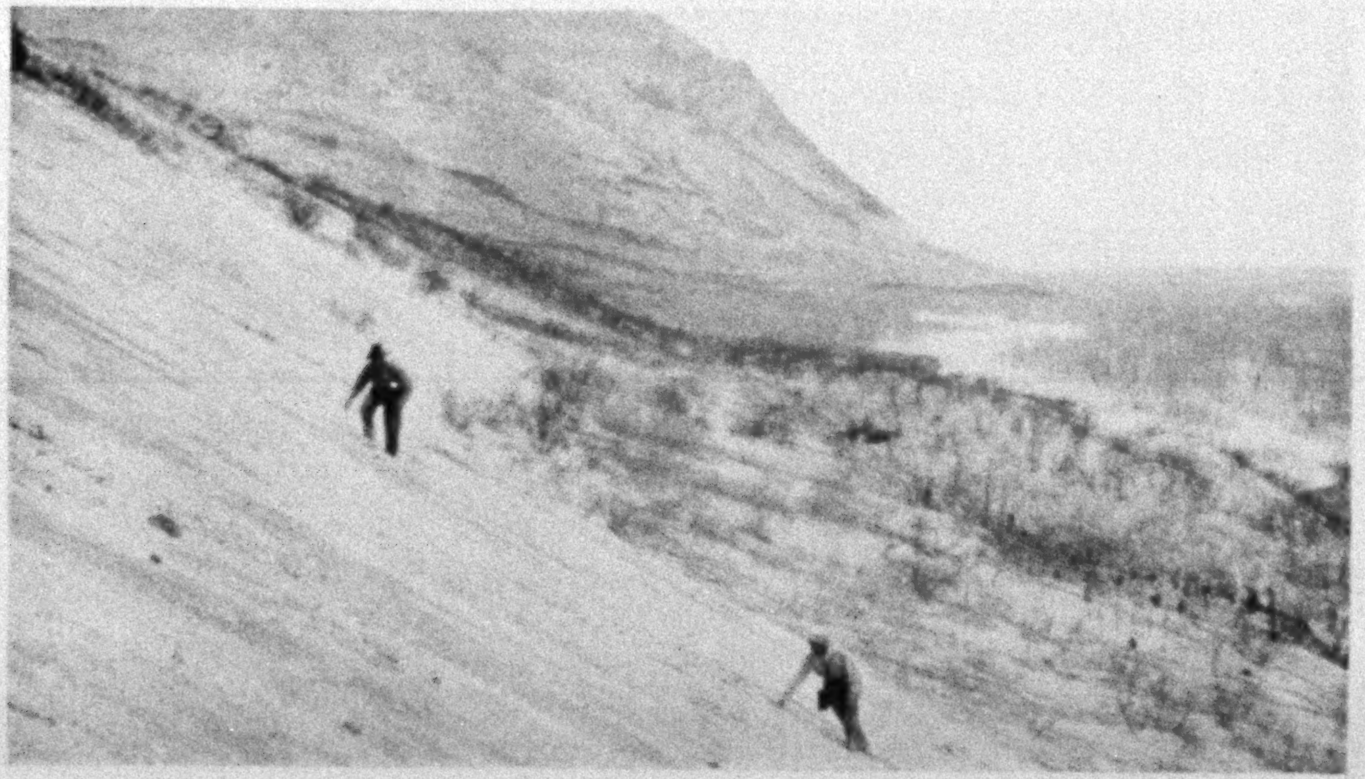
of this stream as it wrestled with the pumice in its bed. Dammed up in the failure of a previous attempt, it would gradually accumulate enough energy for a new effort. Then suddenly breaking loose from its bonds, it would rush forward down the slope, pushing a pile of pumice before it, as though to engulf the onlooker, writhing this way and that like a live thing, picking up pieces of pumice and floating them along as it came. Before it had gone far, however, its new load would literally choke it, and it would give up the struggle in a hiss of grating pumice stones.

It was quite a problem to secure water from such streams. The water always carried such quantities of large angular pumice fragments, not to speak of sand and mud, that it was out of the question to attempt to wash in the brooks. If we tried, the pumice would so grind into our flesh as to prohibit any further efforts at cleanliness. But while washing is a matter of choice, one must drink whether or no. We were obliged everywhere to strain our water through one of our food-bags. Often we would have to strain a quart of pumice to get a pint of water. The stream changed so rapidly that we sometimes had to move before we could fill a bucket. Straining, of course, removed only the coarser grit.

At one of the camps our water was so full of mud that Mr. Folsom refused to wash his face for three days, because he "did not want to dirty it with the water we had to drink."

CAVERNS FORMED BY SNOW MELTING BENEATH THE ASH

The day after crossing Soluka Creek we climbed the mountain to the west in hopes of seeing the volcano, for we feared lest the fine weather which had favored us would come to an end before we should attain our object. Our quest, however, was vain, for when we reached the summit we found that another summit, not marked on our map, cut off our view so that we could not see Mount Katmai. This we called Barrier Mountain.



Photograph by R. F. Griggs

AN ASH SLIDE; SOLUKA CREEK

Some of these slides spread out into gigantic fans more than a thousand feet high. Standing at the critical angle, their slopes are very hard climbing. We soon ground our finger-nails to the quick in the sharp sand of these slides.

We tried to cross the pass to reach a position where we could see the condition of the volcano, but were balked by a new kind of difficulty. On the way up one of us, sticking his staff into the ground harder than usual, discovered that it went through into a cavern beneath. Examination showed that we were supported on an arch of ash a foot thick, spanning a deep hole.

We found that the mountains everywhere were deeply covered with snow, which was concealed by a mantle of ash and pumice blown over it by the wind. The snow beneath was rapidly melting out in the warm weather, leaving the ash surface standing as smooth as ever above the cavity.

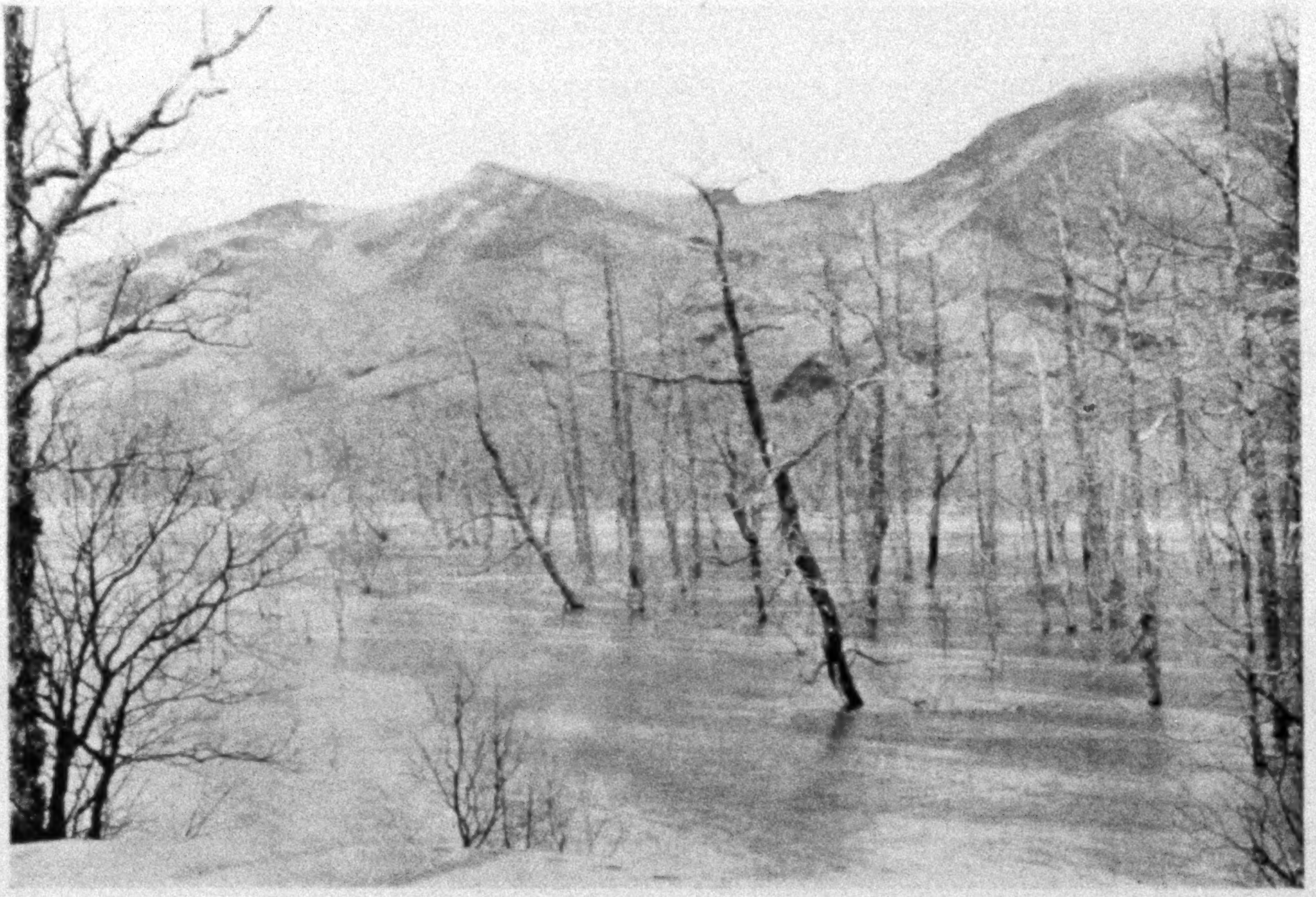
Such small holes as the one into which we had accidentally broken were, of course, of no consequence; but as we looked down one of the side valleys, we could see great cave-ins in an apparently smooth ash field, where a stream burrowing through the snowdrifts beneath had undermined the surface. For half a mile or so the tunnel thus made had caved in, and then for another half mile it was still intact, giving no indication of its presence to an unwary traveler (see page 41).

Reflecting on the significance of such phenomena for us, we carefully chose a path free from all appearance of buried snowdrifts. We had not gone a hundred yards, however, when I happened to stamp my foot and was astonished to hear the ground beneath me ring hollow. We quickly retreated, spread out, and tried another place. We had not gone far when all three of us at once, though 50 feet apart, detected a cavern beneath us. We had absolutely no means of judging whether the hole was 5 feet deep or 50, nor of estimating the strength of the roof.

The danger of such a situation was altogether too great to undertake, so we reluctantly turned back, with as yet no view of the volcano.

AN AWE-INSPIRING VALLEY OF DEATH

The following day we started to encircle the mountains into upper Katmai Valley. As we proceeded the country became progressively more desert. Small birds which were common in the lower valley were absent here. The stillness of the dead forest was oppressive. One could travel all day without hearing a sound but his own footfalls and the plunge of rushing water. The bear trails persisted until we turned the corner into the upper valley, but there they disap-



Photograph by D. B. Church

THE GLOOMY STRETCHES OF SOLUKA CREEK: TREES ALL DEAD

I must confess that even after many crossings of this sinister stream without mishap I could never plunge in without a shudder of dread. So wide that from the middle we could see neither shore, its swift current everywhere churning the quicksand, it presents a formidable obstacle to a man carrying a pack. I was in constant fear lest some member of the party would be mired in its depths, for, although we seldom sank below our knees, we could plunge the full length of our alpenstock into the quicksand anywhere without finding bottom (see text, page 35).

peared. Beyond that point there were no signs of animal life, except a pair of bald eagles, which reconnoitered our camp the first night, a few mosquitos, and, curiously enough, a humming-bird moth, which seemed strangely out of place in such a valley of death.

Clouds hung so low that everything above a thousand feet was obscured, but as we pushed up into the valley a feeling of tremendous awe possessed us. We had quite exhausted our stock of superlatives in the lower valley and found ourselves altogether without means of expressing the feelings that arose in us or of describing the scene before us.

MORE EVIDENCE OF A TREMENDOUS FLOOD

As we proceeded, evidences of flood damage rapidly increased; but we noticed that none of the tributary streams had been affected, and when we reached the forks of the river we found that the whole flood had come down from under the volcano itself, wreaking havoc in its way. A deep channel had been eroded in the pumice deposits. Part of the way it had washed out all of the pumice and had cut into its original bed besides.

For miles where thick forests had stood the trees were sheared off at the surface of the ash (see picture on page 42, taken a year later, after the stream had cut away the pumice, exposing the stumps). The few trees which remained were bent, twisted, splintered, and broken in every describable manner. In places, sheltered from the extreme fury of the waters, the trees were piled high with driftwood.

The volume of water had been enormous. We found high-water marks 25 feet above the bed of the stream where the valley was two miles wide.

Photograph by B. B. Fulton

THE AUTHOR STRUGGLING THROUGH THE QUICKSAND OF KATMAI RIVER

The swift water running over the ash and pumice packs the surface, giving it a crust which sometimes holds a man and sometimes breaks under his weight. Crossing these flats is somewhat like traveling in snow with a weak crust. One will go along easily ankle deep for a few steps and then suddenly drop down to his waist. The labor involved in such travel cannot be described, but must be experienced to be appreciated (see text, page 41).

As we gradually came fully to comprehend what a tremendous catastrophe this flood had been, we were more and more thankful for the good luck which had delayed our expedition until after it had passed. If we had landed a week earlier, we would certainly have been overwhelmed, unless by chance we had happened to be on high ground, out of the valley, at the time of the disaster.

We had finally penetrated as far as we could up the valley and camped, as we hoped, about opposite Mount Katmai; but we could not be sure of our position, for the clouds hung low.

A FLOW OF BRIGHT RED MUD MORE THAN TWO MILES LONG

Here we beheld a formation quite different from anything else we had seen. A ravine which branched off from the main valley behind a spur of the mountain was filled by what looked like a great glacier, except that its color was a bright terra-cotta red. In every detail of its form except for its crevasses it was exactly like a glacier; beginning at a considerable elevation, where the ravine was narrow, it sloped evenly down to the valley level, widening as it descended, so as to assume a triangular form.

If the color had not been so different from everything else in the landscape, we would have been quite sure it was a glacier covered with dirt. But in such a situation no glacier could have escaped without a thick covering of the omnipresent ash. We concluded, therefore, that it must be a mass of mud which had run down off the volcano.

Later, when we visited it, its structure confirmed this theory. As it lay on top of the ash, it had evidently been formed since the eruption. Although it was hard and firm, so as to be easy walking, both its structure and its form showed clearly that it had reached its position in a semifluid condition. Like a glacier, it had a

Photograph by L. G. Folsom

RESTING ON THE TRAIL

relatively steep front and was convex, highest in the middle, so as to turn the drainage off to the edges, along each of which a deep canyon had been cut.

But despite the indications that it had once been fluid, we saw no mud-cracks or other evidence of shrinkage upon drying out, such as one would have expected to find in a mud-flow. Its length we estimated by our pedometer at 2½ miles. Its highest part attained an elevation of nearly 1,000 feet, from which point it sloped to about 300 feet at the base. We were not so well able to estimate its thickness. But along the edges where it was cut into by the streams a section about 50 feet thick was exposed. In the middle it may have been much thicker, both on account of the convexity of the surface and the greater depth of the valley floor.

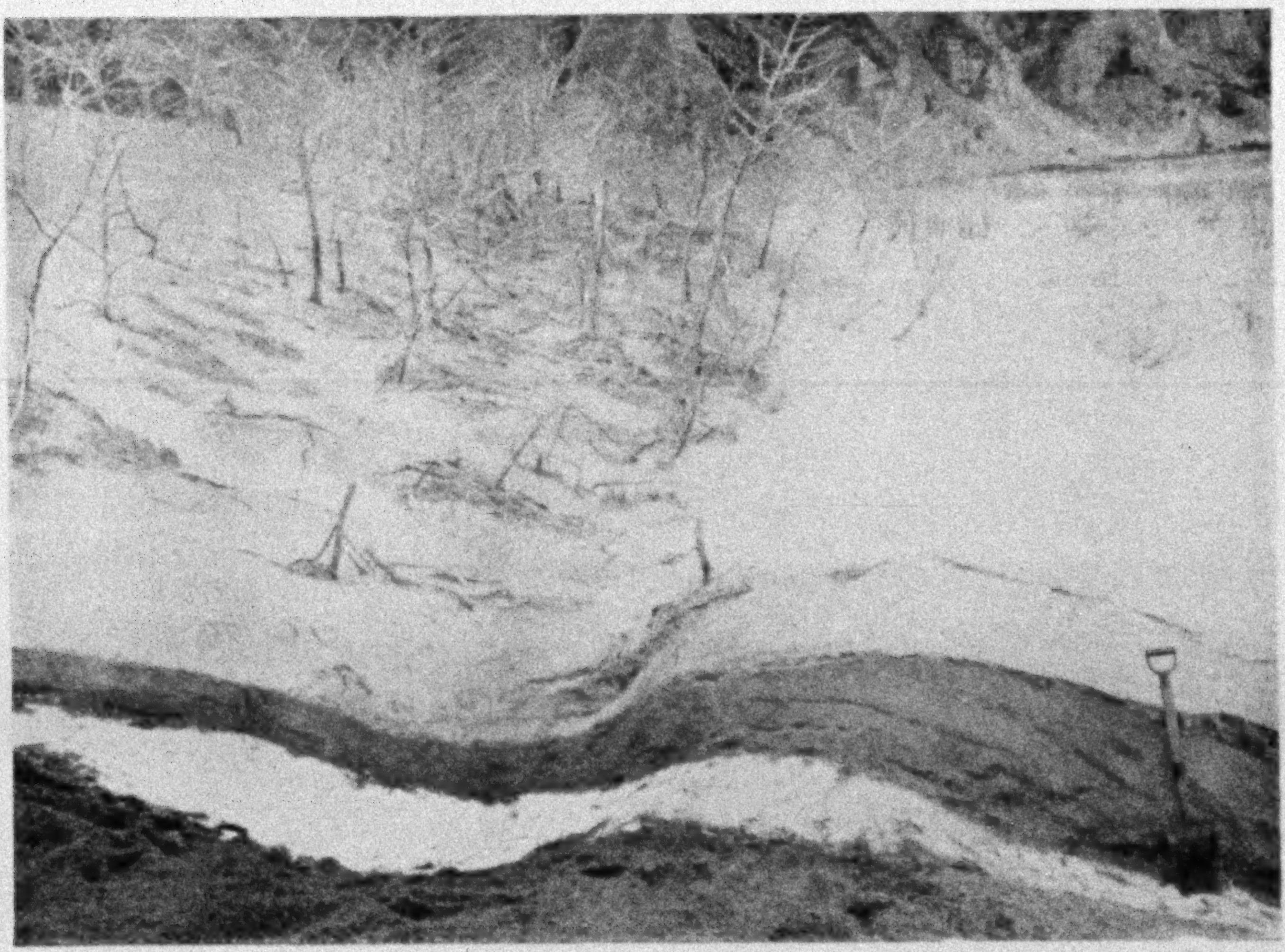
Under erosion, this and other similar mud-flows, later found, develop very striking bad-land topography, so that on a bright day one might almost imagine himself to be in western North Dakota if it were not for the streams trickling everywhere from the melting snows. When the mud dries it becomes hard and holds its shape, so that the sides of the gullies remain vertical, as they are cut by the streams, and do not crumble away as would softer soil.

LAVA ALL BLOWN TO FRAGMENTS

We were very much surprised at the character of the ejecta close to the crater. Post-cards are current in Alaska showing great rocks which are said to have been "hurled from the volcano," and we ourselves had expected to find something of the sort.

The fact is, however, that the violence of the explosions was so great that everything which came out of the crater was blown to "smithereens." Pieces of pumice six inches in diameter were hard to find, and the very largest piece we could discover near Mount Katmai was less than nine inches in its longest dimension.

Nowhere was there any flow of lava in connection with the recent eruption. This is due to the fact that the lava as it rose through the throat of the volcano was so heavily charged with gases, mostly steam, under enormous pressure, that on reaching the surface it was either blown into a froth of pumice by the sudden ex-



Photograph by D. B. Church

A SNOWDRIFT COVERED BY TWO FEET OF WIND-BLOWN ASH, NEAR KATMAI VILLAGE, AT SEA-LEVEL, JULY 15

Thus protected from the sun, melting of the snow is so retarded that in many places formerly uncovered early in the season the snow now fails to melt away and is accumulating year by year.

pansion of the included gas or exploded and was completely disrupted, forming ashes and dust.

On first thought one is apt to be more awed by a force that could hurl great rocks through the air than one which merely throws up ashes and dust. But when one reflects that ash and pumice are rock blown to fragments by the violence of the explosion, he realizes that much mightier forces are involved than would be required to toss boulders about.

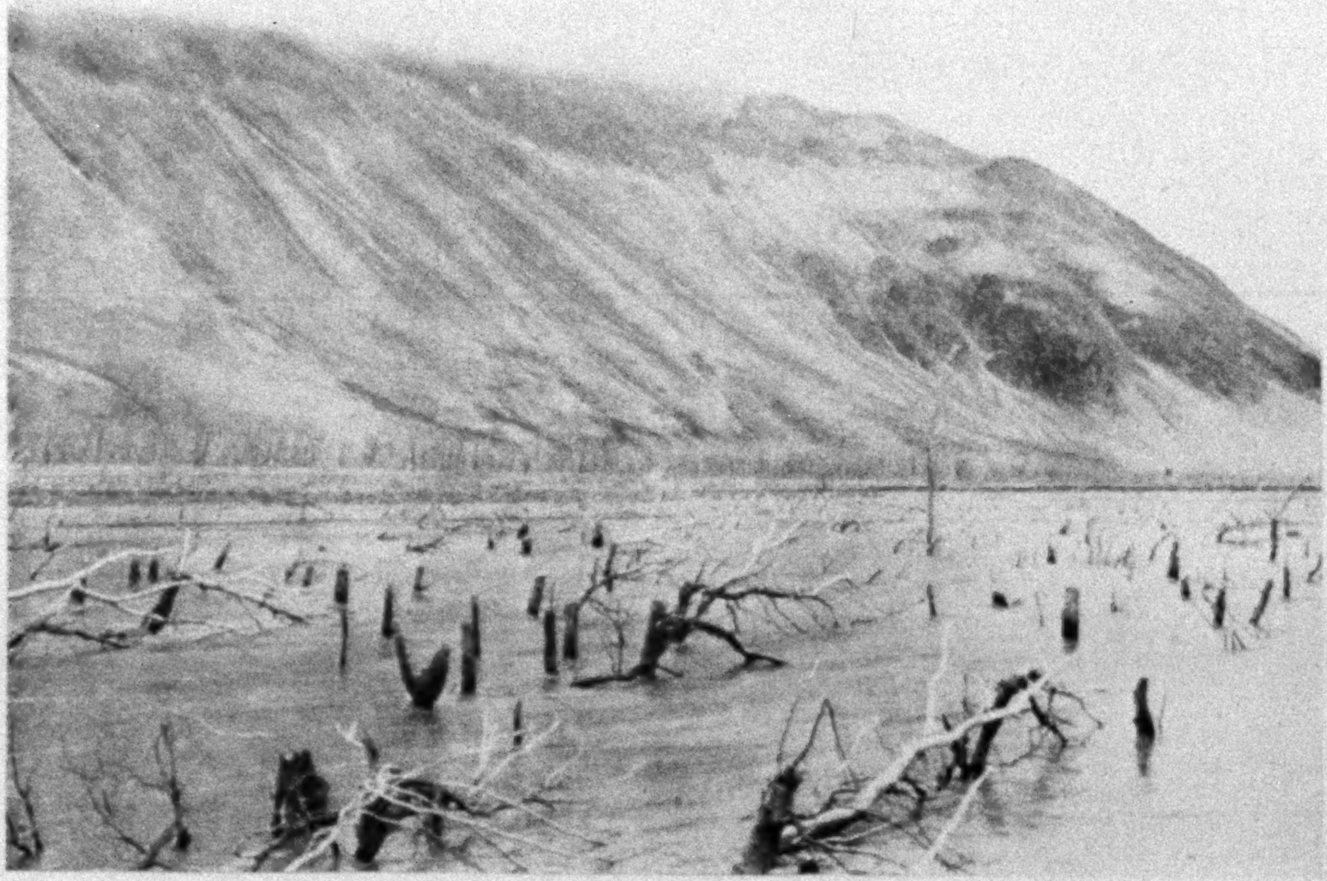
CROSSING THE RIVER

In spite of the desolation of the valley, even in the shadow of the volcano, some few remnants of plants persisted in sheltered nooks on the steep mountain side. In our climb we found living plants of devil-club, lady-fern, salmon-berries, a willow, a sedge, and a bedstraw. The leaves of most of these were injured around the margins, and in general they appeared more dead than alive, though, of course, still retaining the possibility of later becoming the means of revegetating the country.

Our next venture was to try to cross the river to examine the lower slopes of the volcano and the mud-flow. This we found a very formidable undertaking. Although the stream was divided into many channels, none of which was deep, it was so swift as almost to carry us away. Indeed, both Fulton and I went down under its current and succeeded in getting out only with difficulty. We did not mind the ducking, even though the water was icy cold, but we were in fear of wetting our precious cameras (see page 39).

A SECOND NEW VOLCANO—THE TRIDENT

After two days of waiting, the sky cleared, and when we woke we beheld the whole range. Off to the westward was a steady column of steam rising from Mount Martin, which was concealed be-



Photograph by R. F. Griggs

THE GREAT ASH SLIDE OF SLIDE MOUNTAIN

Our experience in taking this picture furnished an amusing example of our inability, even accustomed to stupendous dimensions as we were, to form any real conception of the size of the wonders by which we were surrounded. Desiring to have a scale by which the size of the slide could be gauged, I sent one of the men up on it for that purpose; but, to my astonishment, when he emerged from the forest and began to climb up the slope I could barely make him out, much less find him in the resulting picture. Our triangulation gave it a height of nearly 1,900 feet (see text, page 34).

hind a foothill, which, from its position, we named Observation Mountain. Next were the three peaks of Mount Mageik (see page 32), covered with newly fallen snow. Across its northwestern slopes formerly ran the trail to Bering Sea, across Katmai Pass, which, though reputed difficult and dangerous, looked very easy from our position.

On the northeast side the pass is flanked by a lofty three-peaked volcano, which we called The Trident (see page 65). Its three peaks are arranged in semicircular fashion, leaving between them an amphitheater open toward Katmai Valley, which looks somewhat like an ancient crater breached on one side. The highest peak appears from the valley like an almost perfect cone, truncated at the top as though by a crater. Its height as given by the chart is 6,790 feet.

The present crater is a fissure at the base of this peak (altitude about 3,500 feet), from which issued, somewhat intermittently, a column of steam. Although the volume of this steam was quite small in comparison with that of Mageik and Martin, it sometimes assumed quite respectable proportions, rising 3,000 feet or more. There is good reason to believe that this vent also appeared in connection with the great eruption.

OUR FIRST SIGHT OF MOUNT KATMAI

Next in line beyond a wide pass stood Mount Katmai itself. This was quiescent during our visit and at first sight presented a rather disappointing appearance, for its glaciers and snowfields were so covered with ash as to make it suffer from comparison with Mount Mageik. As we studied it, however, we saw that its great bulk reduced its apparent height.

The crest, as seen from the valley, forms a great arc some three miles in length, highest at the ends, and broken in the middle by a sharp, tooth-like rock, which stands up out of the lowest place in the rim. Even from the valley the edges of this curving rim are so sharp as to give the top a hollow appearance, indicative of the great crater within (p. 48).

MOUNT KATMAI IS NOW MERELY A STUB OF ITS FORMER BULK

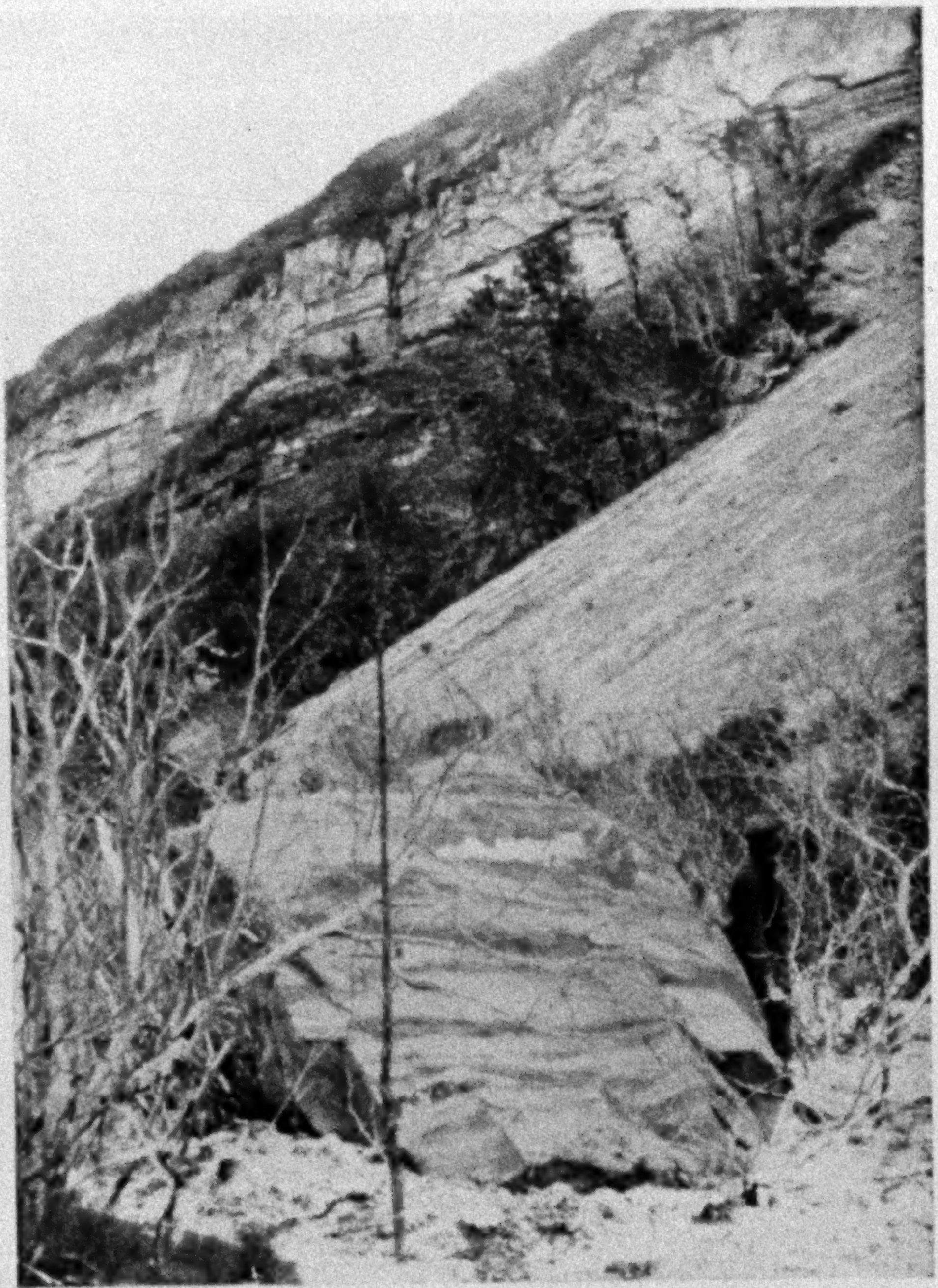
Although Mount Katmai was seen by many white men before the eruption, there is no record of any photograph or description of it; so that there is no very definite means of determining the configuration of the mountain before the explosion. It was higher than Mageik, however, and originally must have quite overshadowed the latter, because, though much less conspicuously placed in the valley, it gave its name to both river and town. The Coast and Geodetic Survey's chart of the district shows a three-peaked mountain with an elevation of 7,500 feet. The highest peak was to the south, while the middle one was 7,360 feet and the north 7,260 feet high respectively.

From the contours of the chart I have made a diagram of the mountain before the eruption for comparison with its present condition (see page 49). But even without the information given by the chart, it is evident that *the present mountain is merely a stub of a much greater peak of former days.*

Coming back into the lower valley after the total desolation of the country in the shadow of the volcanoes was like regaining the earth after a visit to the inferno. How green the trees looked! How the birds sang! How beautiful the green mountains! And this was the country on which we had exhausted our superlatives of devastation in an effort to compare it with Kodiak! We ourselves had not fully realized the awful devastation near the volcano until we felt the relief from its contemplation in the comparative verdure of the vicinity of the ruined village.

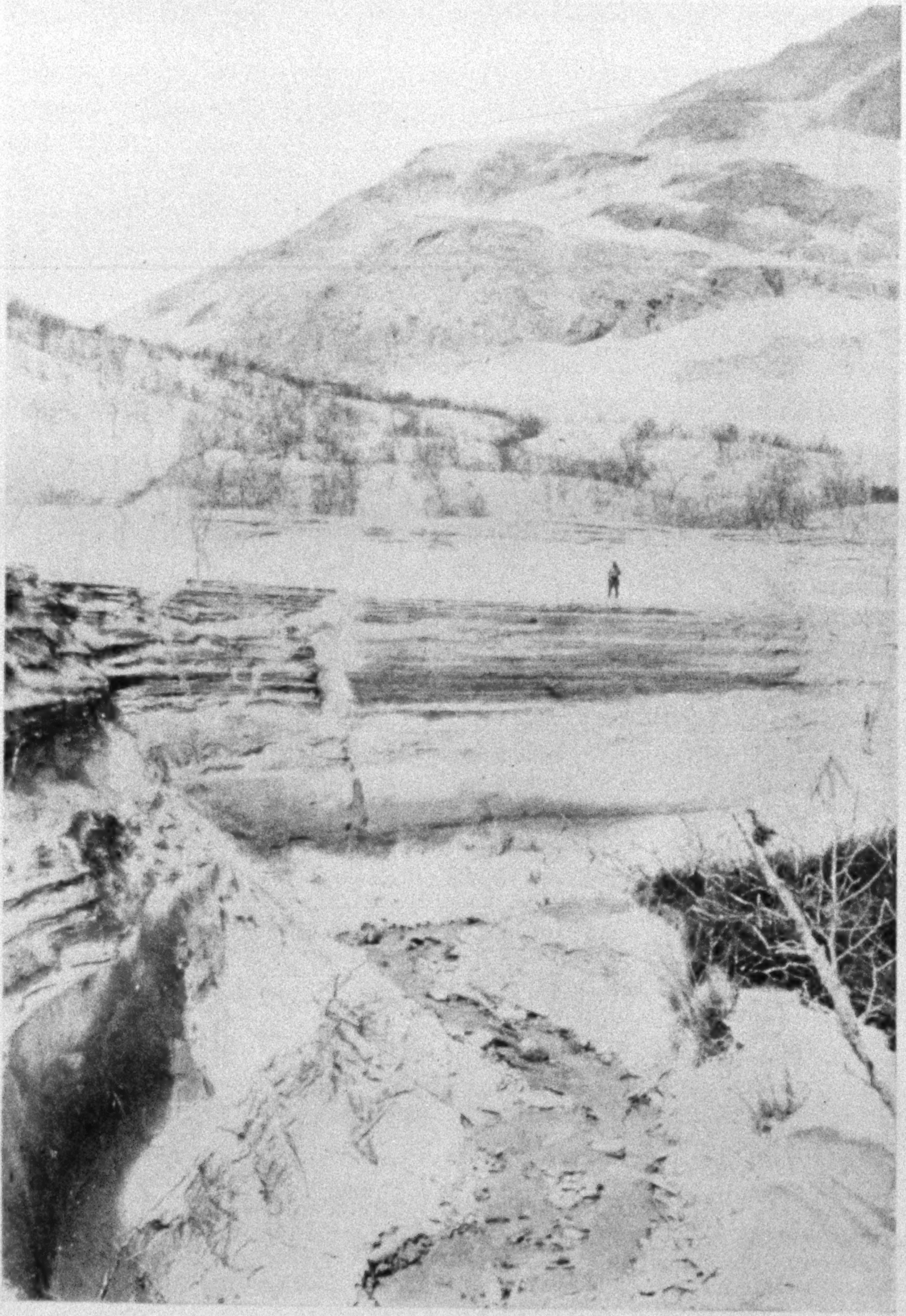
We were much relieved to find our base camp intact. Although a wolverine had been prowling around, he had evidently been suspicious of such fresh signs of man and had not disturbed anything.

On July 29 we began to look for Mr.



Photograph by R. F. Griggs

A ROCK WHICH ROLLED OFF THE MOUNTAIN SIDE ACROSS OUR TRAIL WHILE WE WERE UP THE VALLEY



Photograph by B. B. Fulton

AN ASH ACCUMULATION ON A TRIBUTARY OF SOLUKA CREEK

The streams covered their beds with many feet of ash after the eruption. Later they began to remove the ash, sometimes cutting deep canyons, as in this scene, where the human figure indicates the tremendous depth of the ash fall.

Photograph by R. F. Griggs

ON THE TRAIL IN THE UPPER VALLEY

Since the country was completely devastated, it was necessary to carry everything we had; if any essential thing had been forgotten the expedition would have been stumped

Johnson to come to take us back to Kodiak, according to appointment. We learned later that he tried to reach us both that day and the next, but was unable to land. On the 31st, however, the weather was clear and calm, so that he was able to get ashore.

We were rejoicing in the prospect of a speedy return to Kodiak, but soon found that our troubles were not over, for before he could get us off a "northeaster" blew up, so that he had to abandon us hastily on the beach and make for his boat with the word "Back at the first chance." The sea rose so quickly that he had difficulty in regaining the sloop and reaching a place of safety. It was not for three days that he was able to return, and then, although there was considerable surf running, we lost no time in getting aboard (see page 27).

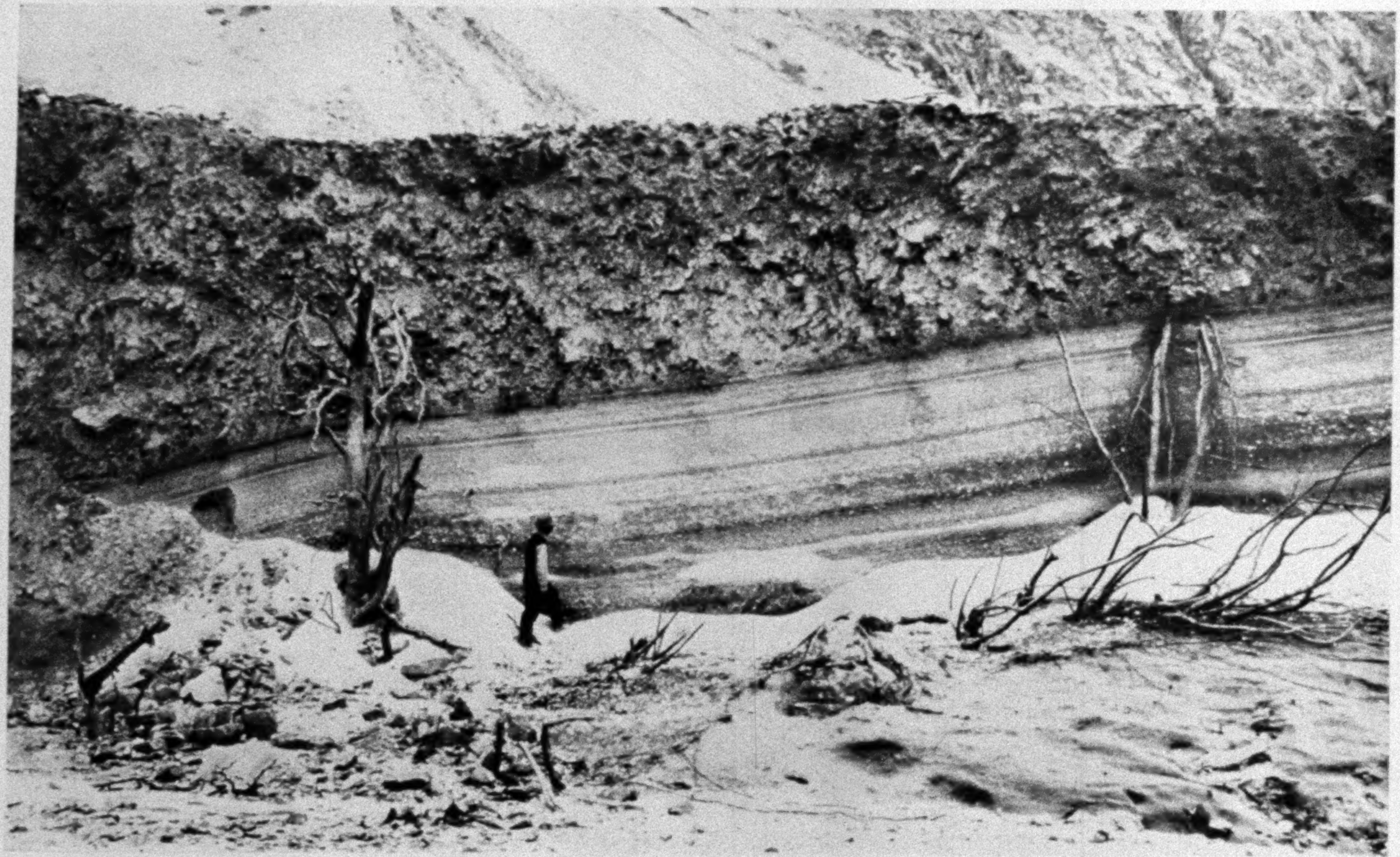
ORGANIZING THE EXPEDITION OF 1916

The expedition of 1916 was carried out on substantially the same lines as that of the preceding year, except that it was possible to organize the work more thoroughly and to provide against various contingencies which could not have been foreseen without the experience of the previous year. The party consisted of Mr. Folsom, Mr. D. B. Church, as photographer, and myself. The experience of the previous year showed the necessity of the employment of a packer also.

Here we met one of our most difficult problems, for we found that the natives were afraid of the volcano and could not be induced to go to the mainland. When we broached the matter to the chief, he said at once very positively, "Me no Katmai," and we learned later that he had advised his followers, "Life is better than money."

The problem was most happily met, however, when we thought of Walter Matroken, the celebrated one-handed bear hunter of Kodiak. He agreed to go without any hesitation and stuck to his promise, although, as we found afterward, the other natives used all sorts of arguments to dissuade him.

Already a hero among his fellows because of his many exploits as a hunter,



Photograph by B. B. Fulton

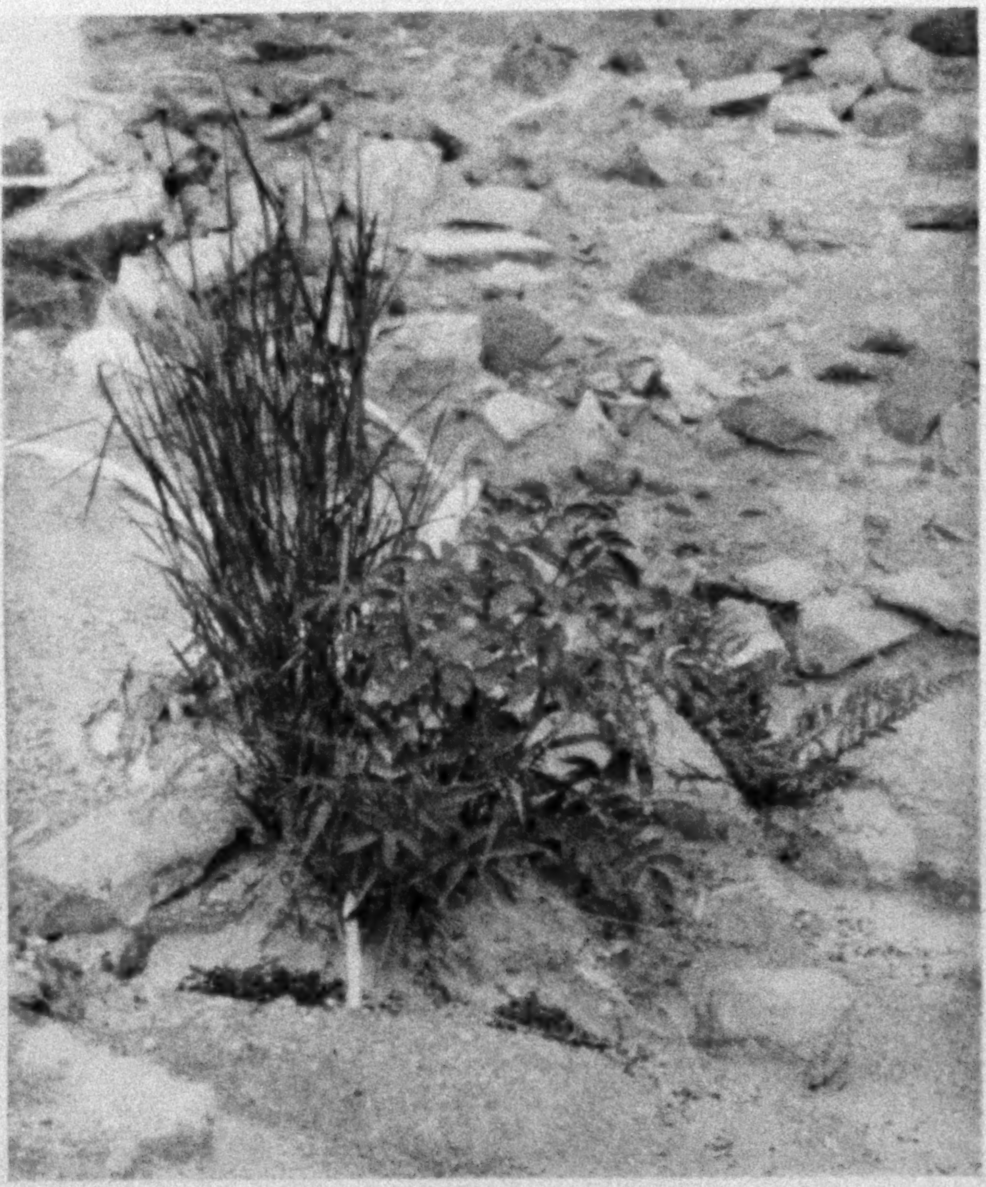
ASH DEPOSITS LYING AS THEY FELL TEN FEET DEEP ON THE LAND

Above is a mass of detritus from an avalanche which cut off the trees at the right. The section was made by the wash of the great flood.

he was doubly so when he returned safely, having actually looked into "The Hole" out of which had come the devastating blast. Even Walter, however, was very nervous on the crater rim, keeping sheltered behind a rock a good share of the time and shifting about uneasily as he watched us work, finally remarking when he thought we had overstayed our time, "Can't make nothing up here."

THE BEAR HUNTER OF KODIAK

Walter was one of those strong characters whom one finds among all classes, who stand out superior to their fellows. Deprived of his right hand by a hunting accident in his youth, he has so overcome the handicap that with his one hand he can accomplish more than most men with two. We found nothing he could not do, even to tying knots and rolling cigarettes.



Photograph by R. F. Griggs

DEAD INSECTS UNDER A SOLITARY TUFT OF HERBAGE IN THE UPPER VALLEY

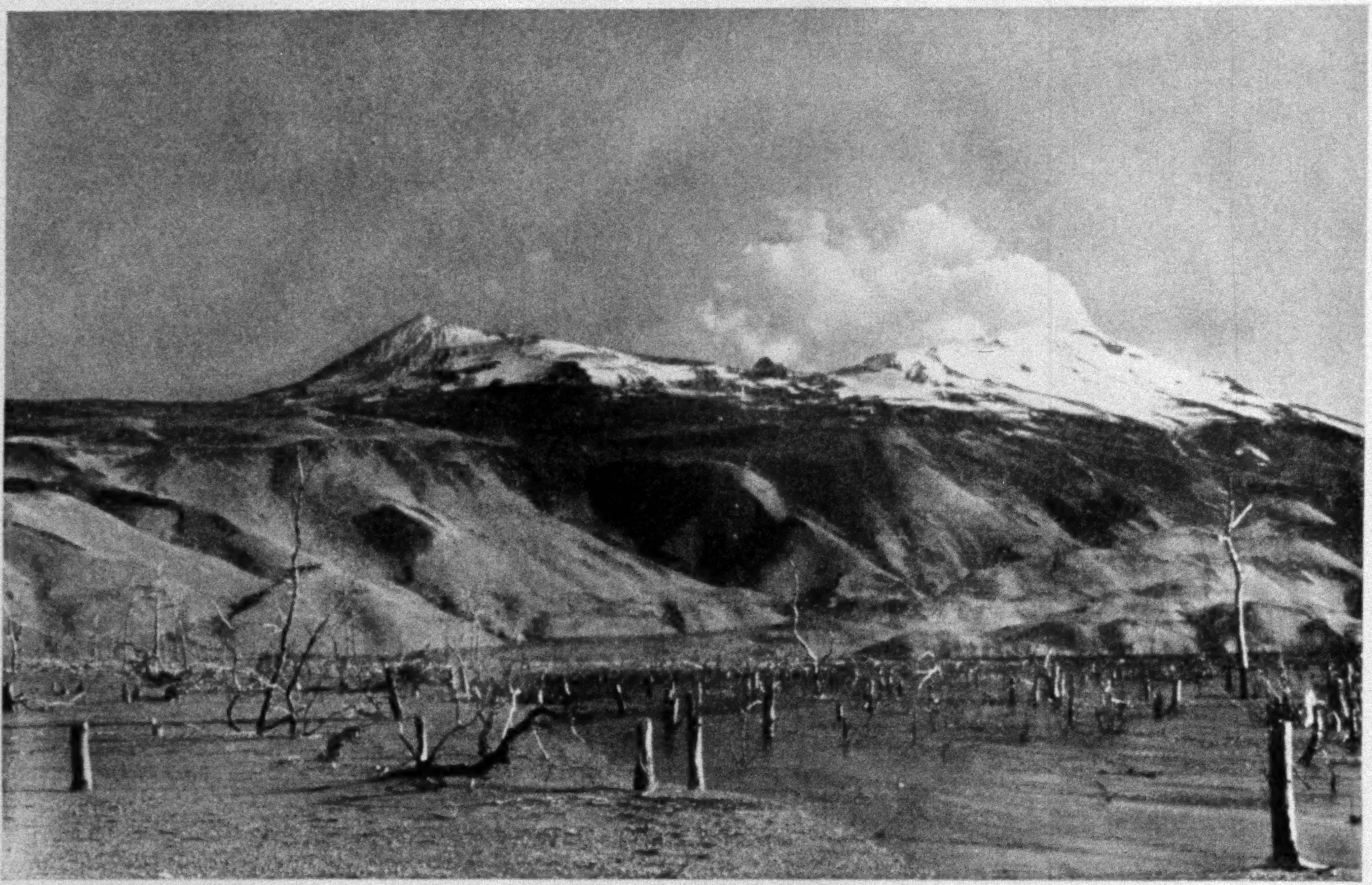
Under these plants was half a teacupful of dead insects of many species (seen as black spots on the ground), which had been attracted by the isolated herbage and come thither in a vain search for food. Perhaps the most striking change in the upper valley observed in 1916 was the great abundance of insects, where there had been practically none the year before.

But when there came a place where we needed some one to handle a boat I supposed that finally I had found his limit, for I could not imagine how any man could handle two oars in one hand. Not so, however, for in a flash he had somehow lashed one oar to his stub and was rowing along as well as anybody.

The general appearance of the country was much the same as it had been the year before; but the mountains were greener, and even on the flat seedlings were beginning to start. When we began to examine old landmarks, however, we found that while the general appearances were unaltered, there had been great changes in detail.

The site of our camp of the previous year we found buried under 20 inches of fresh pumice, washed off the mountain side, while a stream had cut its bed across the place where our tent had stood. The year before this stream had been 50 yards distant and we never dreamed that it might come our way. As we journeyed up the valley, we found other similar changes, but the general conditions were but little different.

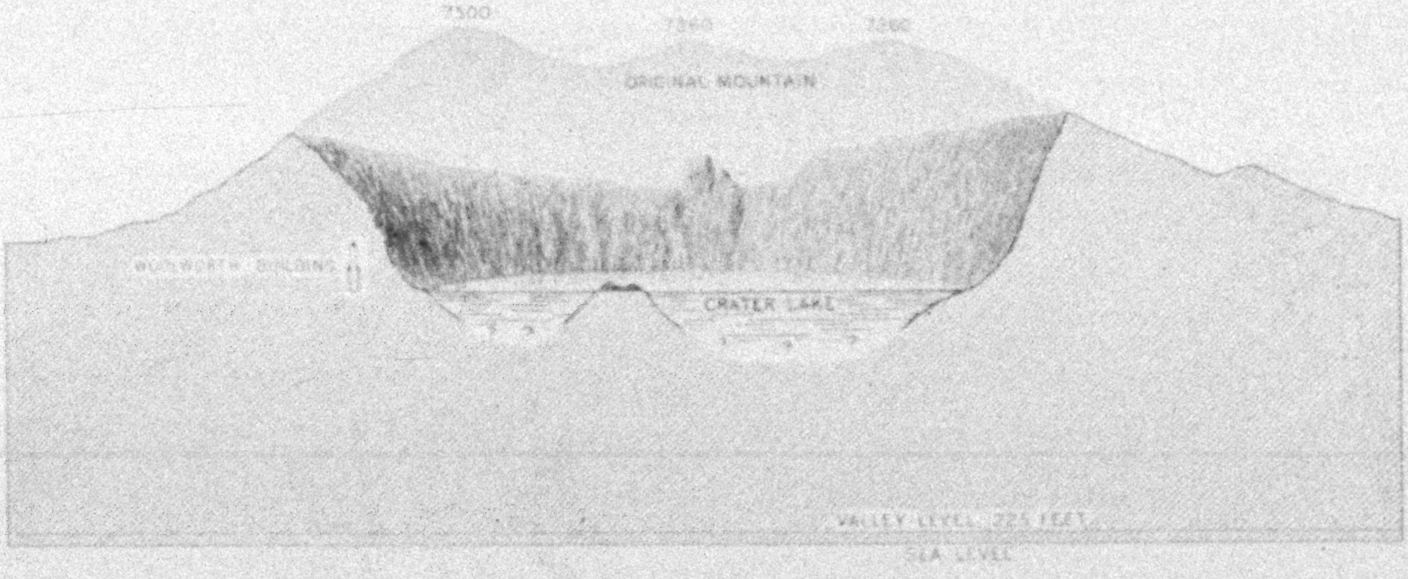
Soluka Creek was the same maze of quicksands that had almost turned us back the year before. I must confess that as many times as we crossed Soluka Creek I never got used to it. Although we



Photograph by R. F. Griggs

MOUNT KATMAI, WITH ONE BRANCH OF KATMAI RIVER IN THE FOREGROUND

Mount Katmai is exactly what it appears—a mere stump of the former mountain, which was completely disemboweled in the eruption. The great arc at the top is the rim of a gigantic crater within. The peaceful steam clouds now floating up from the crater compared with the devastating blast which once issued from it are like the wisps of smoke issuing from the cannon's mouth after the projectile has been fired (see p. 49).



AN ILLUSTRATION OF MOUNT KATMAI AS IT WAS AND IS

Showing the original mountain reconstructed, the present crater rim, and the crater with its boiling lake. The Woolworth Building, drawn to the same scale, gives an idea of the depth of the crater.

never had an accident, I never could free myself from the dread of the crossing and the fear that the next time it would "get" one of us.

GRAND VIEW CAMP

When we arrived at the head of the flat we picked our camp site so as to command a view of the surrounding mountains. The marks of the great flood were no longer fresh on the ground and it was evident that there had been no similar catastrophe during the year that had elapsed. We therefore had no fear of a repetition of the flood and did not hesitate to camp out in the open, choosing, in fact, an island in the river, which, although being cut away by the swift water at the rate of several yards a day, was safe enough for the period of our visit.

I never expect to be privileged to have a camp site surrounded by grander scenery than was this island. On the east side of the valley was the waterfall that we christened Fulton's Fall, nearly a mile away, but the more impressive for its distance, framed in between the brilliant orange and green slopes of two mountains, which we called Slide Mountain and Avalanche Mountain, and backed by the rich red precipices of Barrier Mountain. The latter, though in reality several miles away, at the head of a valley, appeared set just a few hundred feet back of the fall, which has the majestic sweep attained only by falls of much greater height than breadth.

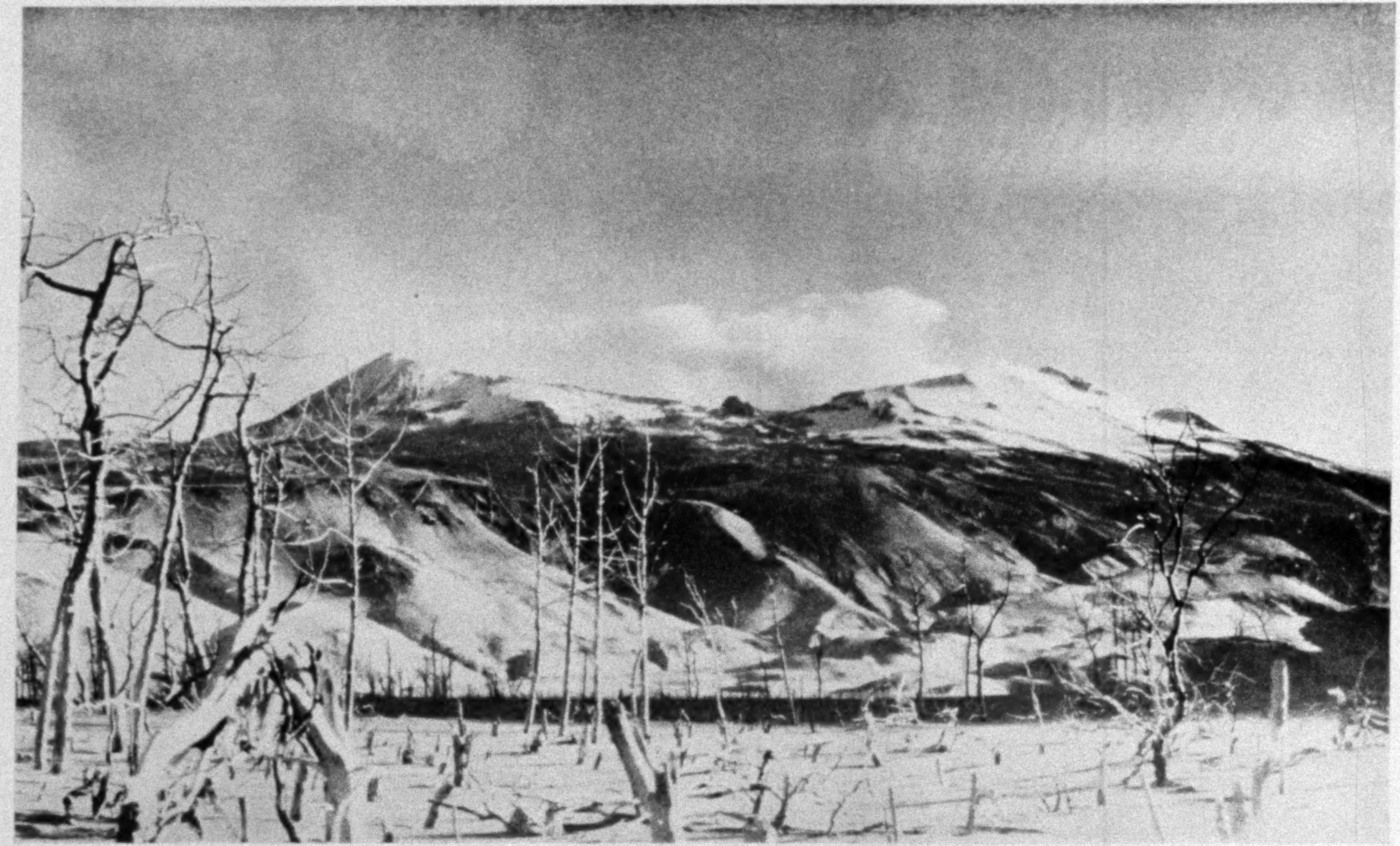
Farther up at the head of the valley stood the 1,500-foot cliffs which guard the entrance to the inner canyon of Katmai River, while towering aloft over inaccessible precipices the summits of Slide and Avalanche Mountains themselves presented fine enough spectacles to command attention in any other setting. But here they were eclipsed, for on the other side of the valley we could see the whole chain of glacier-covered volcanoes of the main range in continuous series, broken only by Katmai Pass, whose 2,700 feet looked low indeed by comparison.

From north to south were Katmai, Trident, Mageik—partly hidden behind Observation Mountain, and finally the distant steam from Martin (map, p. 23).

It was evident that the activity of all the vents was somewhat greater than the year before. There could be no longer any doubt but that considerable steam was rising from Katmai, whereas the year before we could not be certain of any activity. The column from Mageik was larger, and there was a small column rising from a point well down on the slope of Martin which we had not seen before.

INDICATIONS OF ACTIVITY ON THE BERING SEA SIDE OF THE RANGE

In addition to these vents, every time it was clear we saw very definite indications of more volcanoes on the other side of the range. Through Katmai Pass we could see two large clouds when every-



Photograph by R. F. Griggs

THE REMAINS OF MOUNT KATMAI (SEE PAGE 49)

The magnitude of the eruption can perhaps be best realized if one could imagine a similar outburst centered in New York City. All of Greater New York would be buried under from ten to fifteen feet of ash; Philadelphia would be covered by a foot of gray ash and would be in total darkness for sixty hours; Washington and Buffalo would receive a quarter of an inch of ash, with a shorter period of darkness. The sound of the explosion would be heard in Atlanta and St. Louis, and the fumes noticed as far away as Denver, San Antonio, and Jamaica.

where else all was clear except the "steamers." Over the isthmus connecting Katmai and Trident we saw, as we had in 1915, similar signs of activity.

These were, however, very puzzling, elusive, uncertain—quite different from the steady columns rising from Mageik and Martin; for they were not only inconstant and variable in volume, but equally uncertain in position, appearing now at one point and now at another (see page 65).

STARTING FOR THE FIRST ASCENT

On finding the sky clear and bright the morning after our arrival, July 19, we decided to see how the river was and to reconnoiter the volcano with a view to picking our path for the climb when the proper time should come.

When we started we had little idea of making the ascent, expecting to content ourselves with reconnoitering the lower slopes. But as we went on we became more and more anxious to try the climb. So, leaving the mud-flow at about 800 feet, we started up the long ridge which runs out parallel with the canyon. This was easy going, with a gentle ascent up to 2,000 feet, when we suddenly came into sight of the upper valley of Katmai River.

THE TREMENDOUS FLOOD EXPLAINED

We found that the canyon was only as long as Mount Katmai itself, while farther on, the valley turned to the east and expanded again into a flat, in which we discovered three large lakes, blue as the sky, in strong and grateful contrast to the gray land.

But what especially surprised us was suddenly to discover the origin of the flood which had so sorely puzzled our party the year before (see pages 20 and 38). A stream flowing between Katmai Volcano and its neighbor had piled up an immense dam across its valley. Behind this dam a vast lake had accumulated until the pressure of the impounded water became irresistible, when the dam burst and the torrent, like a Johnstown flood, rushed seaward, fortunately without human toll.

Turning from the lakes with the hope that we might be able to return and explore them, we roped ourselves together and decided to have a try at the slopes above.

We were on dangerous ground from the outset. The surface was covered by many feet of ash overlying snow, which, melting out from beneath, made the surface slump away and crack open in all directions, while at intervals boiling torrents issued from the cavernous depths. No experience with snow bridges could give any precedent for judging the strength of such ash bridges and we had no means of knowing what to expect.

It was with fear and trembling that I ventured out across the first and, as it proved, the worst of these bridges. It was only a few feet wide, with perpendicular edges 30 feet high, while from beneath came a roaring torrent, which divided just below, part going down behind the arrête we had come up and part tumbling directly down the face of the mountain.

CLIMBING THE MUD-PLASTERED SLOPES

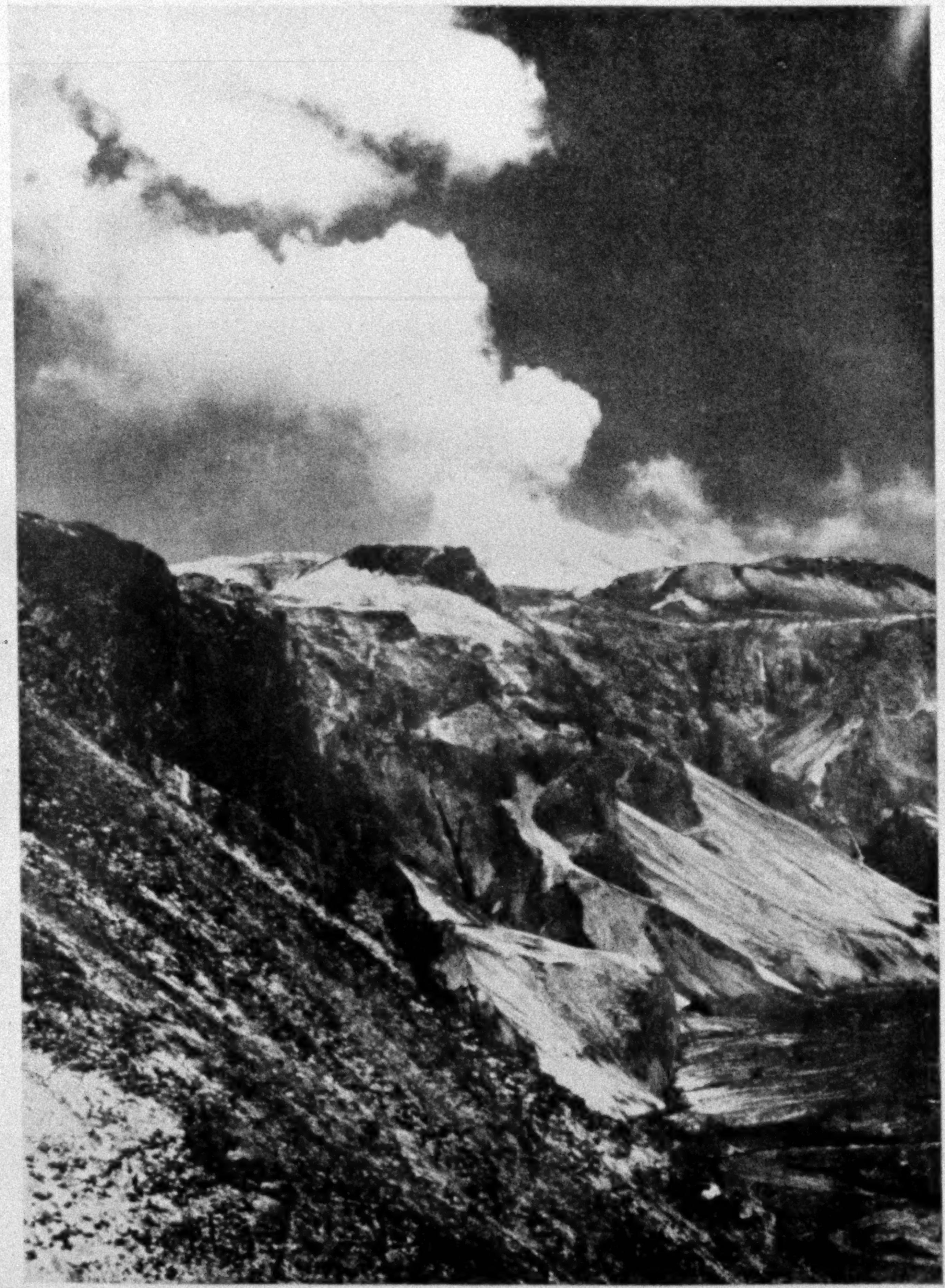
The slopes were all plastered with mud of varied colors—gray, yellow, chocolate, red, black, and blue—the results of the last spasms of the great eruption.

At the lower levels the mud was dry and hard, making easy going; but as we ascended, it soon became slippery, and a little higher soft and sticky. Most of the way it was about ankle deep, but in spots we went in nearly to our knees; and at times it required all our strength to extricate ourselves (see page 53). Unpleasant and laborious as walking through deep mud is under any circumstances, we found traveling up the slope very hard work indeed.

Above 4,000 feet the way was mostly through soft snow, with only occasional mud patches, and the slope became steeper as we advanced.

As we reached the higher levels the scenery became superb. We could see Kodiak Island across the strait over the tops of the nearer mountains, which presented a magnificent mass of sharp peaks and intervening snow-fields.

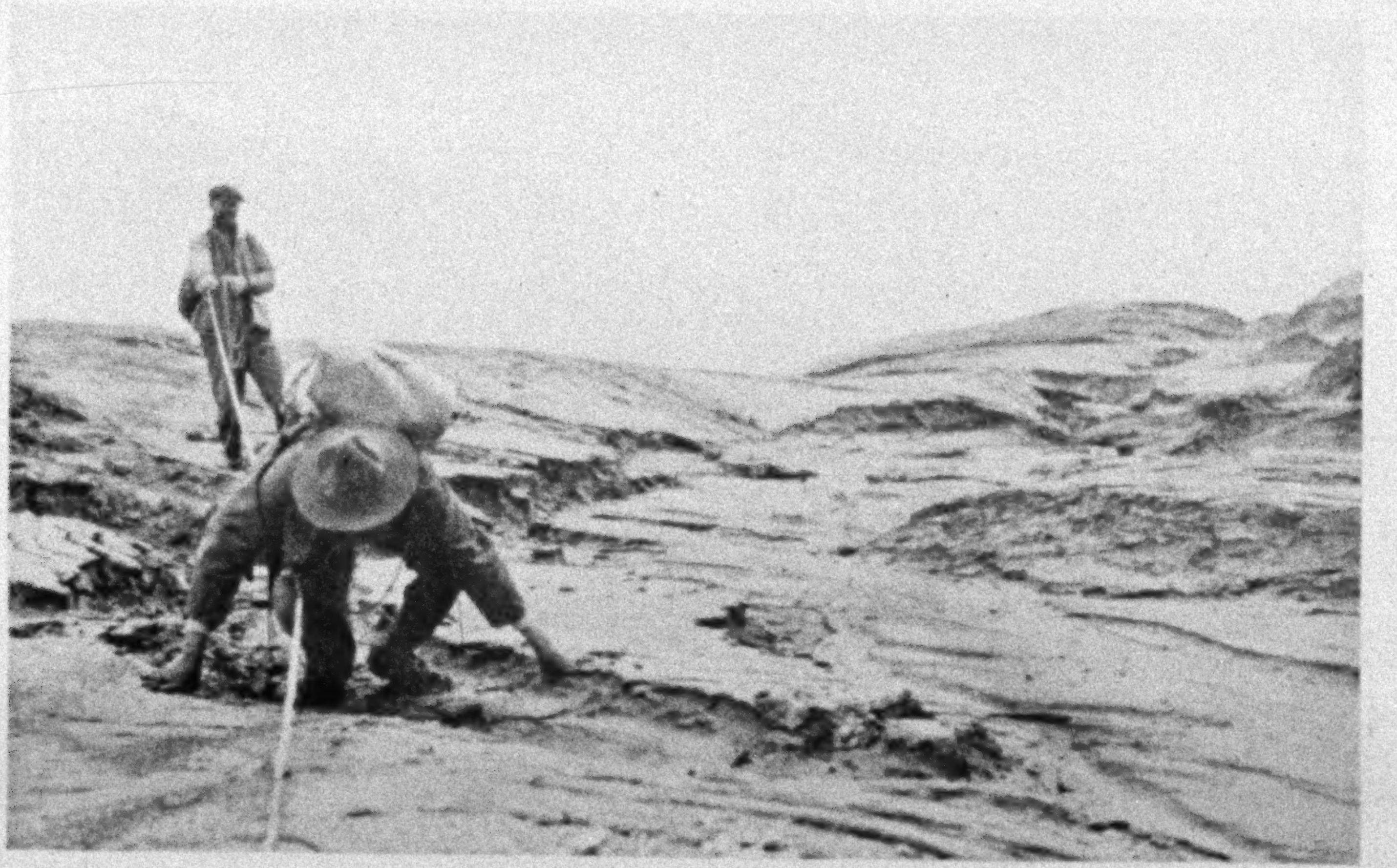
But finer than these was the canyon of Katmai River, which lay stretched below us. Flanked by the multicolored mud-



Photograph by R. F. Griggs

STEAM RISING FROM MOUNT KATMAI: VIEW FROM PROSPECT POINT

The ash slides of the recent eruption contrast with the massive ancient lava flows. At the right are two fine waterfalls. The summit stands about a mile above the observer (see text, page 55).



Photograph by R. F. Griggs

STUCK IN THE MUD ON THE WAY UP TO THE CRATER

The slopes of the volcano are covered with soft, sticky mud and slush (see text, page 51)

flows, with the river hidden within the lower gorge, this resembled greatly the Grand Canyon of the Colorado, and indeed, except for its shortness, rivaled the latter in its proportions, for it is about 4,000 feet deep, of which about 1,500 feet is the inner gorge, cut through beautiful delicate green rocks, not to be matched in the Grand Canyon (see pages 55 and 58).

STEAM FROM THE CRATER OBSCURES THE SUMMIT

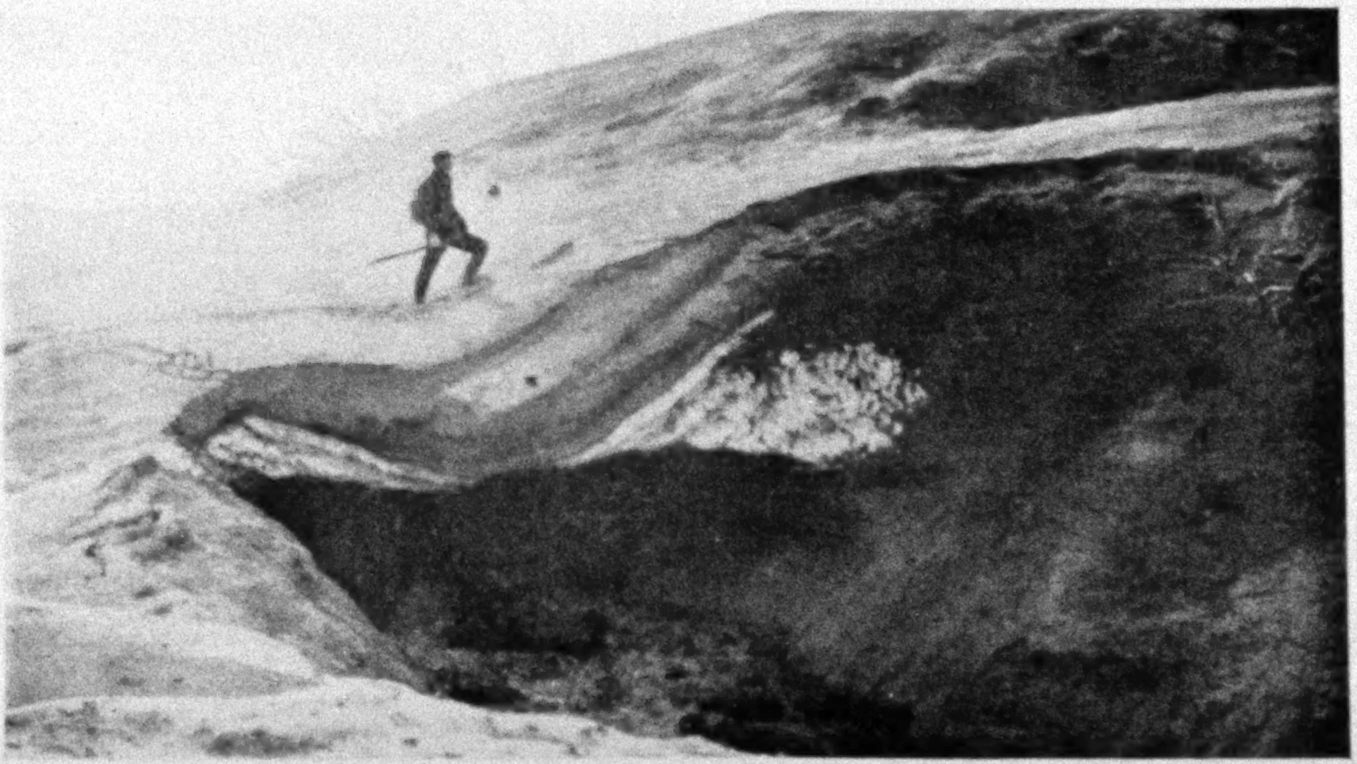
Long before we reached the brim the hard work had begun to tell on us and we were becoming tired, especially Church and Folsom, who were carrying packs. Mr. Church in particular deserves great credit for lugging the big camera, with its tripod weighing 20 pounds, to the summit. He told me afterward that he could never have done it except for two facts—that he was hitched to a rope and could not get away and the fear that if we turned back today we would have it all to do over again tomorrow.

As it began to cloud up, we were afraid we would not be able to see anything if we did reach the rim. All the other summits as far as we could see were clear, but Katmai became densely covered with black, heavy clouds which permitted only occasional glimpses of the top. Furthermore, we were on the lee side of the crater instead of to windward, as we should have been. We knew these clouds must be due, in part at least, to the activity of the volcano, because of the strong sulphurous odor which filled the air, but could not tell how much was to be attributed to this cause and how much was simply due to the greater altitude of the volcano.

As we came closer we could see that the clouds were in rapid motion, coming straight up out of the crater. What if we should reach the rim only to poke our noses into a steam jet through which we could see nothing! Nevertheless we were unwilling to give up now without at least a try, and so we pressed on.

THE CRATER

Finally, at 5,500 feet, we reached the rim. The inside wall was standing nearly perpendicular and great masses of snow and mud were cracked off from the edges, ready to fall in; so that I did not dare to look over the edge, even though anchored by the rope, until I could find a



Photograph by R. F. Griggs

AN ASH-COVERED SNOW BRIDGE SPANNING A STREAM WHICH CUT ITS WAY THROUGH BENEATH

The caving in of such bridges, which are often concealed, constitutes one of the most serious dangers to which the explorer is subject

place which looked safer. Then we approached the edge. Nothing could be seen through the rising steam.

But, as we looked, there came a little rift and we could see something blue far below us. Then the steam cut us off again and we waited. Again it blew away and we were struck speechless by the scene, for the whole crater lay below us. It was of immense size and seemed of an infinite depth.

A VITREOLIC LAKE

About half of the bottom was occupied by a wonderful blue and green vitreolic lake, with the crescent-shaped remains of an ash cone near the middle. In the larger end was a circle of lighter-colored water which was in continual ebullition.

Around the margin were a thousand jets of steam of all sizes, issuing from every crevice with a roar like a great locomotive when the safety valve lets go. On the far side, close to the water, were two large, bright yellow spots of sulphur, while in two angles of less activity there were snow-fields.

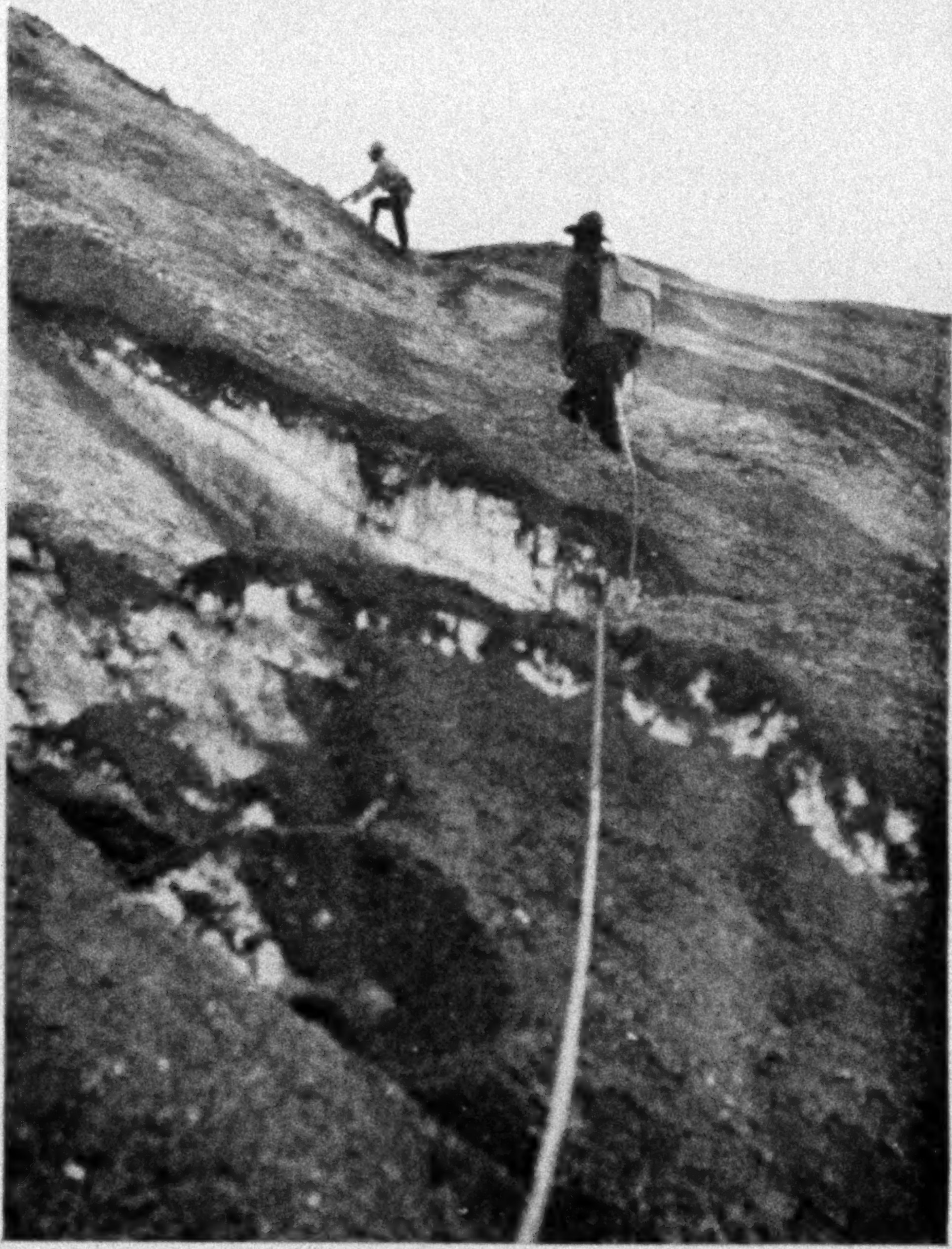
The perpendicular sides near us were composed entirely of frozen mud and fragments of various sorts of ejecta, and nowhere in the whole ascent did we encounter bedrock. On the opposite side of the crater we could see that the greater part of the wall was composed of lava and tufa, the successive flows giving it a roughly stratified appearance.

We were powerless to form any real estimate of the size of this stupendous hole. It was clear, however, that it occupied all of the area within the rim, which from below appears three miles long. As to the depth, the best I could do was to look in and then try to carry the same level to the slope up which we had come. Thus estimated, the depth was apparently about 1,500 feet. This estimate we subsequently had to enlarge.

All this we took in almost at a glance. Before we could get our tripod set up the cloud closed in again and we waited amid a thunderous roar of escaping steam. Were we to be cheated of the coveted pictures after all? Finally the cloud lifted a little and frantically we made our exposures.

I had planned to take bearings and measurements which would permit more accurate determination of the depth and size, but we were vouchsafed so few clear moments that we could not make them. We had reached the rim at 5.05 p. m. The moment we stopped moving we began to suffer so from our cold, wet feet that waiting was torture; but we lingered on the edge for 50 minutes hoping for better views, but as the clear intervals became less and less frequent we had to give it up and descend. None of us fully realized, I think, how far we had come till we found how long the return journey was, but we reached our camp safely at 10.20 p. m.

Next day I was up at 5.30 to take pictures of the mountains, for practically the only opportunities to get good pictures of the volcanoes came early in the morning. The sky was clear except for a few very delicate cirrus clouds above the mountains to the east. They were long combed out and lay in horizontal lines, drifting slowly toward Katmai.



Photograph by L. G. Folsom

THE ASCENT OVER MUD-COVERED SNOW

The climbers are within a few hundred feet of the crater rim (see text, page 51)

THE WONDERFUL SCENERY OF THE CANYON

Our distant view from the mountain of the second Katmai Valley, with its lakes, and especially the dam, which had caused the great flood, made us anxious to penetrate the canyon and examine the upper valley in detail. But we found it impossible to penetrate beyond the mouth of the canyon, being stopped on the brink of a 500-foot precipice, which we named Prospect Point.

The magnificence of the view from this point was simply beyond description.

It is like the Grand Canyon and the Canadian Rockies all put together and then the volcanoes added. The desert landscape, covered with the many-colored muds from the volcano, together with the fine colors of the rock walls, recall the Grand Canyon. But the upper slopes, with their sharp summits occupied by snow-fields and glaciers, remind one of the Canadian Rockies, in particular of such places as the "Valley of the Ten Peaks."

Down the sides pour numerous waterfalls, some of which are of great beauty. Opposite Prospect Point is one whose thin, misty streams drop 1,500 feet from the top of the inner canyon clear to the bottom (see page 61). Two more, each several hundred feet high, may be seen on the slopes of Katmai (see page 52).

Photograph by L. G. Folsom

PHOTOGRAPHING THE CRATER, SECOND ASCENT

The two sides of the canyon show very different rock structure. The east wall is a 1,500-foot cliff, of delicate green sedimentaries, but little metamorphosed, although shot through by numerous dikes of igneous rock, also pale green. But on the west the river is hemmed in by great mahogany-colored lava flows, whose massive cliffs rise 2,000 to 2,500 feet before giving way to the gentler slopes of the plateau. At least three successive flows may be made out lying superposed one on the other. All appear to have come from Katmai itself, but none of them is recent.

In the more exposed situations the wind has often cut through the different layers of ash, leaving the hillsides marked with many bands and circles, where deposits of different colors have been alternately uncovered.

EXPERIENCES IN A TERRIFIC GALE

Where the unprotected positions were occupied by birches, their dead trunks often bear evidence of the power of wind erosion; for on the northwest side their bark has been all cut away, and in many cases the wood deeply abraded by pieces of ash and pumice flying before the wind (see page 66).

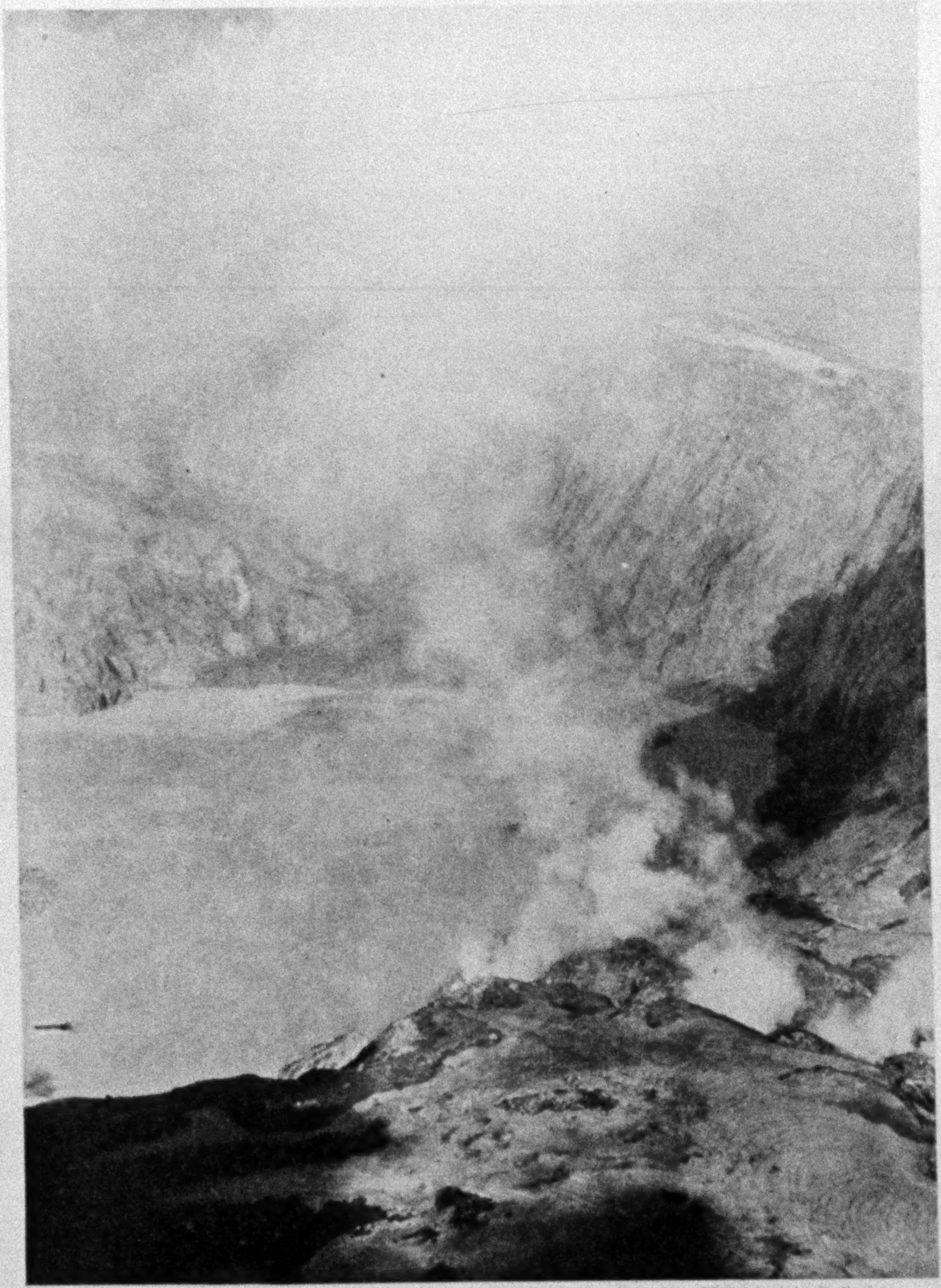
But even such evidences of the power of the wind could not have given us any conception of the terrific violence of the gales if we had not had the misfortune to experience one. For 48 hours it blew with such fury that we were in constant fear lest our tent should be torn to shreds. I would never have supposed that any tent could have stood up under the strain. We had it double-guyed at each end with our Alpine rope, but were not able to keep the pegs from pulling out at the bottom. We could not have held it down without the floor. Several times we held it in place by lying on the floor until the pegs could be driven in again around the bottom (see also pages 17 and 26).

Only less noisy was the bombardment of the sand-blast, which drove against the tent like showers of hail. The power of the wind was such that pieces of pumice even an inch in diameter were picked up and carried away, while others twice as big went rolling along the slopes.

The wind was so fierce that we could not keep a fire, nor could we have cooked anything if we had, for we no sooner put on a kettle of water than it began to fill with sand, so that it could not be used.

THE SECOND ASCENT

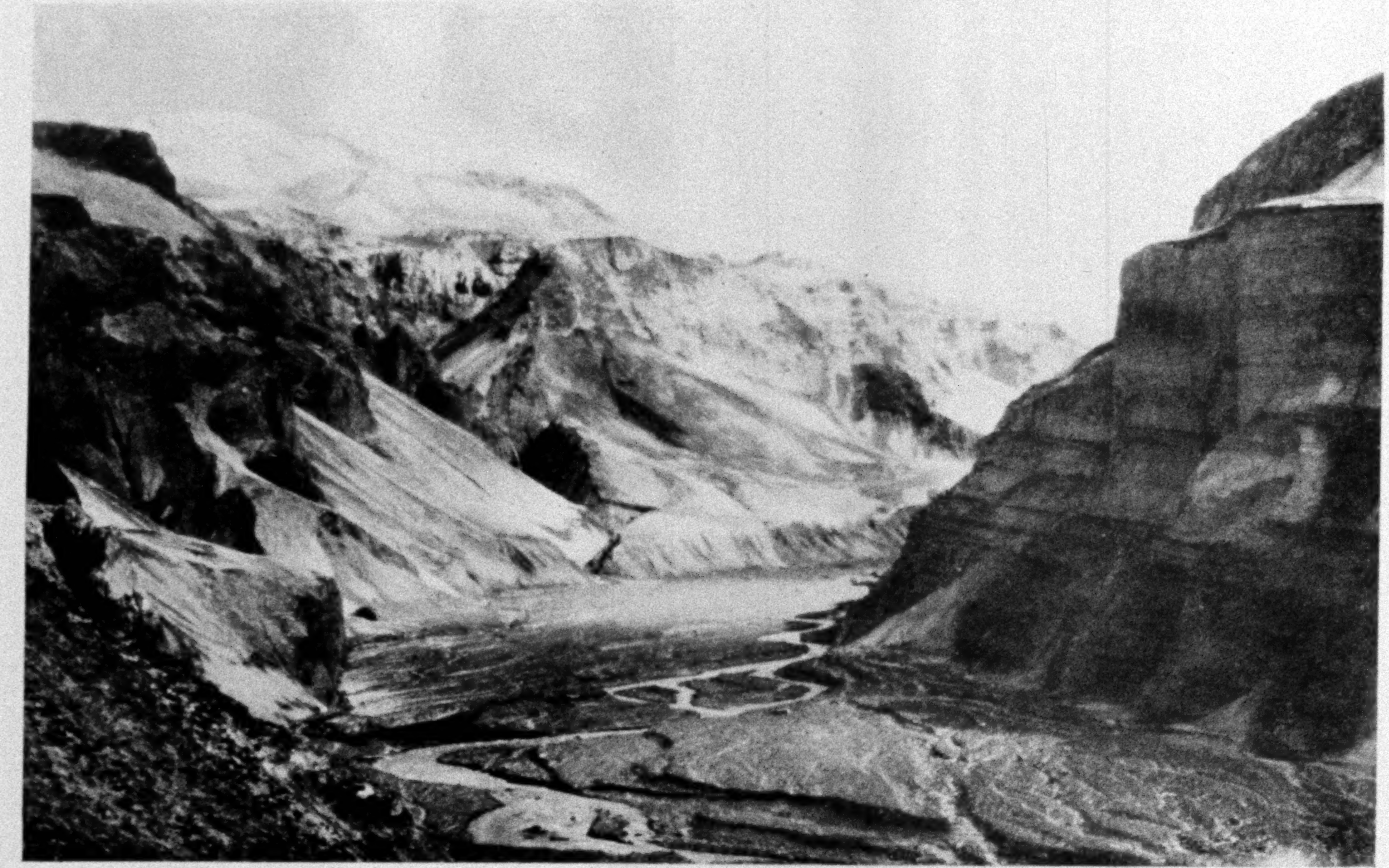
On July 30, for the first time since our arrival in the valley, the steam from Mageik rose straight up into a cloudless sky (see page 30). We therefore decided the conditions auspicious to try for a second view into the crater. This time



Photograph by R. F. Griggs

LOOKING DOWN INTO KATMAI'S CRATER

At the right is the main column of steam, 3,000 feet high. Little jets may also be seen rising from the surface of the boiling lake. Curiously enough, the heat does not melt the snow, which may be seen stretching close up to the escaping steam, its surface grooved by the innumerable rolling-stones which fall in from the cliffs where we stood (see text, page 54).



Photograph by D. B. Church

KATMAI CANYON FROM PROSPECT POINT, ABOUT 500 FEET ABOVE THE RIVER: MOUNT KATMAI IN THE BACKGROUND

The lava flows of the volcano contrast strongly with the sedimentary rocks on the opposite side of the canyon (see pages 53 and 55)

I chose a path over the lava plateau from near the base of the mud-flow. From the valley the ground did not seem especially favorable, and we were by no means sure of reaching the rim when we started; but I was anxious to examine the Trident at close range, and especially to see what might be behind the isthmus connecting it with Katmai, because of our suspicions of activity in that direction.

We got a fine view of Trident, whose crater proved to be a simple fissure, out of which steam was continually issuing in a comparatively small volume (see page 65). But we were disappointed in our hopes of seeing anything over the divide between Trident and Katmai.

Although we traversed the whole length of the nearly level névé at an altitude of about 4,200 feet, we could see no indications of volcanic activity beyond. There were several jagged minor summits, but no large mountain and no clouds; so that we quite dismissed the idea of a volcano in that quarter.

How greatly in error I was in this conclusion I was to find only the next day.

For a good share of the way beyond 2,000 feet our path this time lay across the lines of drainage, which had gashed the level surface of the ash with innumerable gullies anywhere from two to ten feet deep. On our first ascent we had followed straight up a single ridge, and so avoided the necessity of crossing the gullies. This time we soon found that continued jumping across or scrambling up and down the sides of these ravines is very fatiguing and were thoroughly tired of the job long before we got through them.

For the last 1,500 feet our way led across much-crevassed snowfields and glaciers, which, while easier going for the most part, kept us in constant fear of cave-ins on account of the uncertain conditions introduced by the ash-fall. In places we traversed as nasty a series of seracs as one would care to find.

We found that the glacial seracs extended clear up to the very rim of the crater, above whose depths the loose blocks hung with a precarious hold.

We did not dare to approach the edge over such ground and had to make our way around, descending somewhat until we finally reached the rim at the lowest notch, at an altitude of 5,200 feet, beside the rock which breaks the regularity of the arc at that point (see page 56).

This from the valley appears as a small tooth-like projection. Near at hand it is seen to be a great neck of jointed columnar basalt two or three hundred feet high, which evidently owes its preservation to its superior hardness, which enabled it to resist the force of the explosion that blew away the softer rock all around it. Its position and structure indicate that it was formerly a vent filled with liquid lava which, cooling in place, formed the massive neck that remains.

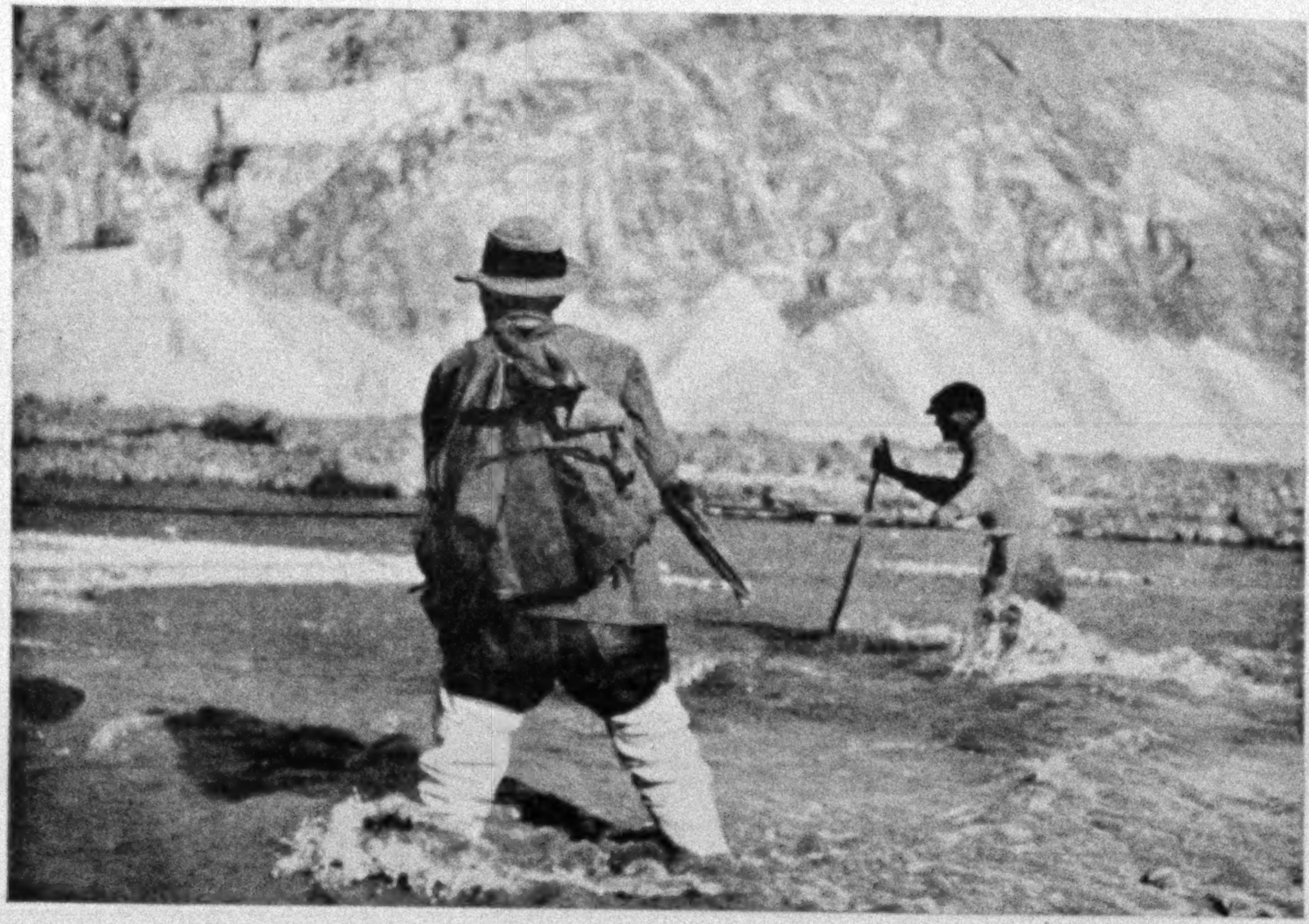
INABILITY TO JUDGE HEIGHT OR DISTANCE

From our position directly under it, its perpendicular cliffs, though insignificant from the valley, appeared immeasurably high! Frequently in this land of stupendous dimensions we had occasion to realize how little conception we could really form of the true sizes of the features around us.

When one stands directly beneath a cliff or at its brink and looks up or down, 200 feet appears as an immeasurably great height. Ten times as much appears no greater unless there are trees, houses, or some such familiar objects beyond, by which one can form an independent judgment of their distance. In a desert country without such objects, we were frequently unable to form any estimate at all of the size of the various features which met our view.

We had an amusing instance of this when, sending a man to climb the great ash slide to serve as a scale for a picture, I found that he was hardly visible to the naked eye and utterly lost in the picture (see page 42). We nearly always found that our estimates were too small rather than too large, and throughout the present paper I have endeavored to scale down my statements of size, so that any errors should be in the direction of minimizing rather than of exaggerating the things we have to report.

Standing on the edge of the crater, we recognized our total inability to form any judgment of its depth by the ordinary



Photograph by D. B. Church

CROSSING ONE OF THE CHANNELS OF THE KATMAI RIVER

While the lower reaches of this river are full of quicksand, farther up it is a rushing mountain torrent, so swift that it was hard to cross even supported on a rope (see text, page 41).

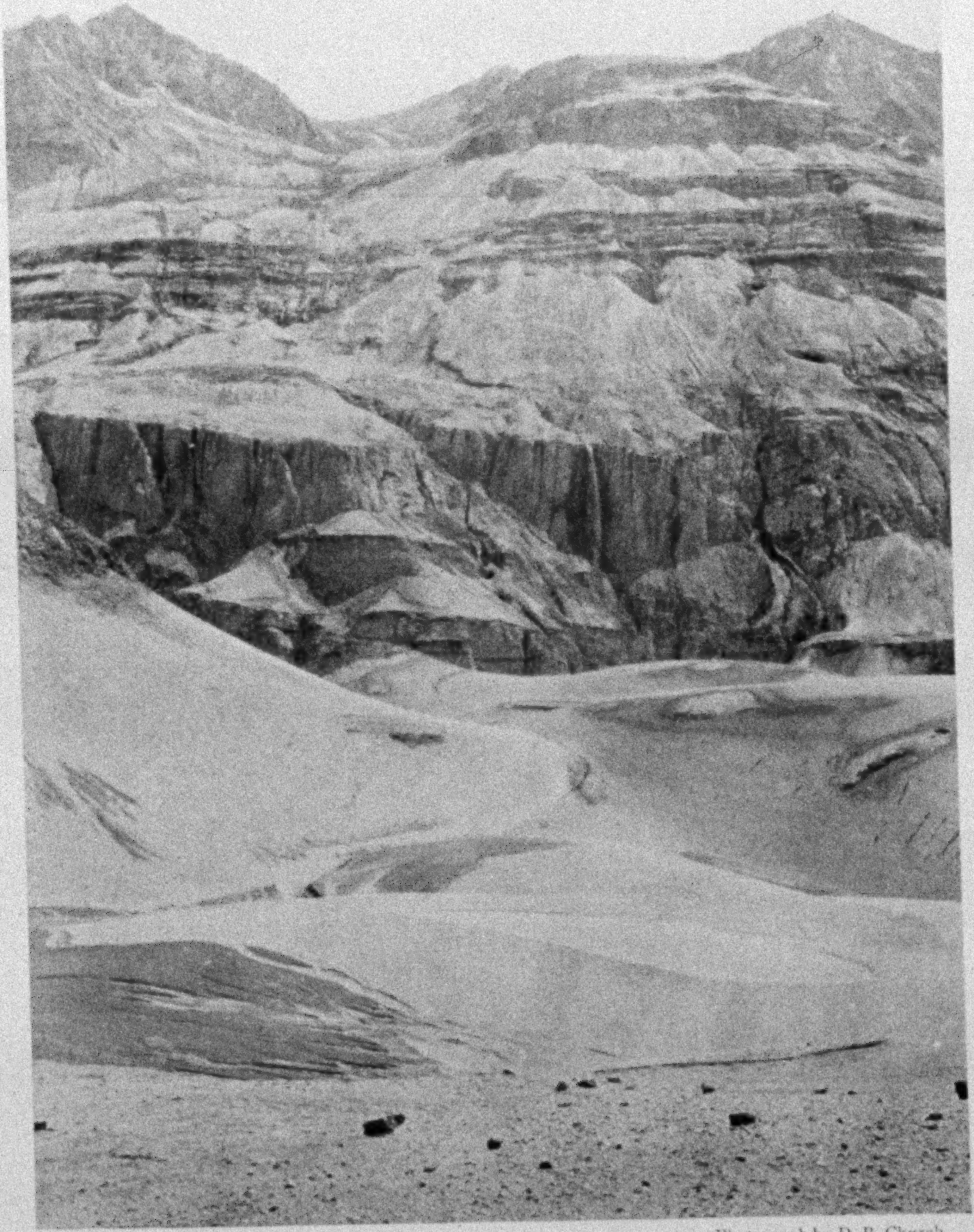
methods one uses in estimating such things. But, using the shape of the volcano as a whole and such differences in altitude of the parts of the crater rim as we could see from the valley for our guide, we concluded that our former estimate must be too small, and that it must be at least 2,000 feet in depth.

THE SECOND VIEW OF THE CRATER

Both the weather conditions and our position were much more favorable for observation of the crater this time than on our first ascent. The sun shone brightly, and it became evident why we had had so much trouble with the steam on the first ascent, for we found that the point which we had reached the first time stood directly above a prominent fissure extending in an easterly direction from the edge of the lake to the crater wall. Its direction was significant in connection with what we were to discover the next day.

The boiling lake this time was all covered with little (so they appeared from our position) wisps of steam curling up everywhere from its surface. The vapor thus given off condensed into a hazy cloud, which hung in the mouth of the crater, so that the part of the rim opposite us was veiled. This haze made it impossible to secure as clear photographs of the crater as we would have wished.

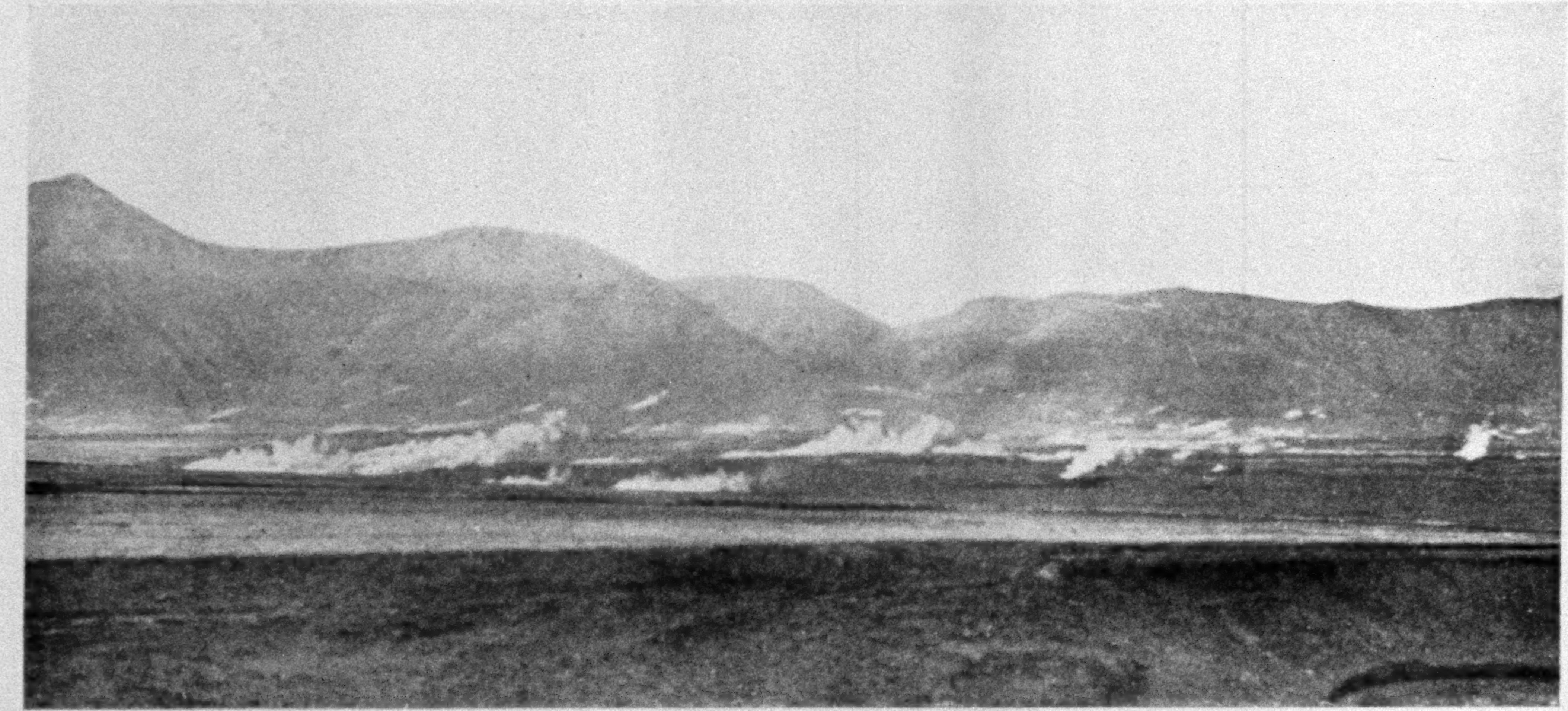
At the northeast angle we could see another low notch in the rim of about the same altitude as the one where we stood. But this one was occupied by a wall of ice which rose perpendicular, flush with the crater walls, as though it had been sheared off by the explosion. It was indeed curious that a moving glacier, however it might have been affected by the eruption, should remain in such a position. It is probably to be accounted for by the falling away of the crater rim, which continually exposes a new section of the ice cliff. As we had made the summit by 3 o'clock, this time we were not so late in getting back, reaching camp again at 8.30.



Photograph by D. B. Church

ACROSS KATMAI CANYON FROM THE LOWER SLOPES OF MOUNT KATMAI

The scale may be judged by the man, who may barely be made out on the trail near the center of the picture. The waterfall is 1,500 feet high.



Photograph by R. F. Griggs

GENERAL VIEW ACROSS THE VALLEY OF THE "TEN THOUSAND SMOKES"

The steam jets are so much spread out that it is not possible to give any idea of their numbers in a photograph. Even in transverse views like this many of the more distant jets are lost in the distance. The strong wind bent them all close to the ground. What a sight it would have been if the columns of steam had risen straight up! (see page 64).

The next day, July 31, dawned as clear and bright as the former; but the cloud from Mageik this time drifted off to the northwest, and small clouds were beginning to gather on the west side of the valley, so that I knew it was to be the last day of good weather.

A MUD-FLOW COVERING TEN SQUARE MILES 80 FEET DEEP

I had hoped to take a two-days' trip across the pass to see if we could find the source of the clouds which had aroused our suspicions. But remembering the bad name given Katmai Pass by Spurr, who states that it was the most difficult pass crossed by his party in their long and adventurous journey in 1898, I had no desire to be caught short of provisions on the wrong side, and so gave up the projected trip and decided to reconnoiter instead. Planning to make an easy day of it, for we were tired after our ascent of Katmai the day before, we climbed around the shoulder of Observation Mountain and descended into the upper valley of Mageik Creek, where we found the largest and most striking accumulation of ash observed anywhere.

The whole flat, occupying a triangular space five miles on a side, was filled many feet in depth by the ash, which had slumped off the mountain sides. One section we traversed was no less than 125 feet thick, and two others 80 feet.

ASCENT TO KATMAI PASS

Having stopped a little while to examine the character of the Mageik mud-flow and to eat our lunch, we made our way forward across the bad lands toward the pass, following now the ridges of the mud-flow, now the bottom of the canyon, which rose in a gentle slope.

As we ascended the valley past the highest peak of Trident, we came into view of the hollow between it and the next peak, from which I had thought several times I saw clear indications of rising steam. The sun was shining into it brightly, so that I could see it all clearly. There was not the smallest puff of steam anywhere to be seen. We were up now to 2,500 feet and could see a long way through the pass, and there was no steam to be seen there either.

So again I concluded, as I had the day before, that we had seen nothing more than the ordinary clouds which gather so easily around the summits of all high mountains.

Church, jaded from the continual hard work, had given out and we left him behind with the packs, much against his wishes, several hundred feet below, while Folsom and I went forward a little farther to see what we could discover. We were both tired from our hard climb the day before, and traveling transversely across the gullied "bad lands" of the mud-flow, which was necessitated by the condition of the canyon below, was very laborious; so that I was ready to turn back satisfied with having seen through the pass and, as I believed, having laid another ghost.

THE FIRST FUMAROLE

But just as I was about to suggest turning back to Folsom I caught sight of a tiny puff of vapor in the floor of the pass. I rubbed my eyes and looked again. Yes, there it was, a miniature volcano sending up a little jet of steam right in the pass. When I saw this I decided that we must go on to investigate, because the very smallness of this steam jet made it of as much interest as a large volcano.

For one of the most striking features of the eruption of Katmai—one which was without parallel in other great eruptions—was the absence of subordinate manifestations of vulcanism outside the main theater of action. I had been continually surprised at the absence of parasitic cones, fumaroles, mud craters, hot springs, and the like in so great an eruption.

Earlier in the day we had found the stream from the hot springs near the pass, mapped by Spurr; but aside from that, this fumarole was the first thing of its sort to be observed. When we reached the pass we found its floor all shot through with cracks and small fissures, from which issued half a dozen good-sized jets of steam and perhaps a hundred small ones.

Photograph by L. G. Folsom

WARMING MY HANDS AT ONE OF THE LITTLE FUMAROLES IN THE PASS

The ground was encrusted with bright-colored sublimations from the escaping gases (see text below)

With some trepidation we approached over the fissured surface and discovered that most of the steam issued from small openings a few inches in diameter, whence it came with considerable velocity, giving forth a low, roaring sound.

We could come quite close and warmed our hands in the steam, which, though very hot as it emerged, soon cooled like the vapor from a tea-kettle.

Coming off with the steam were various other substances, which gave rise to curious evil-smelling odors and precipitated a highly colored crust on the ground. Prominent among these was the "rotten-egg" smell of hydrogen sulphide and of sulphur dioxide, while crystals of sulphur gave a yellow tinge to the particolored sublimations of the crust.

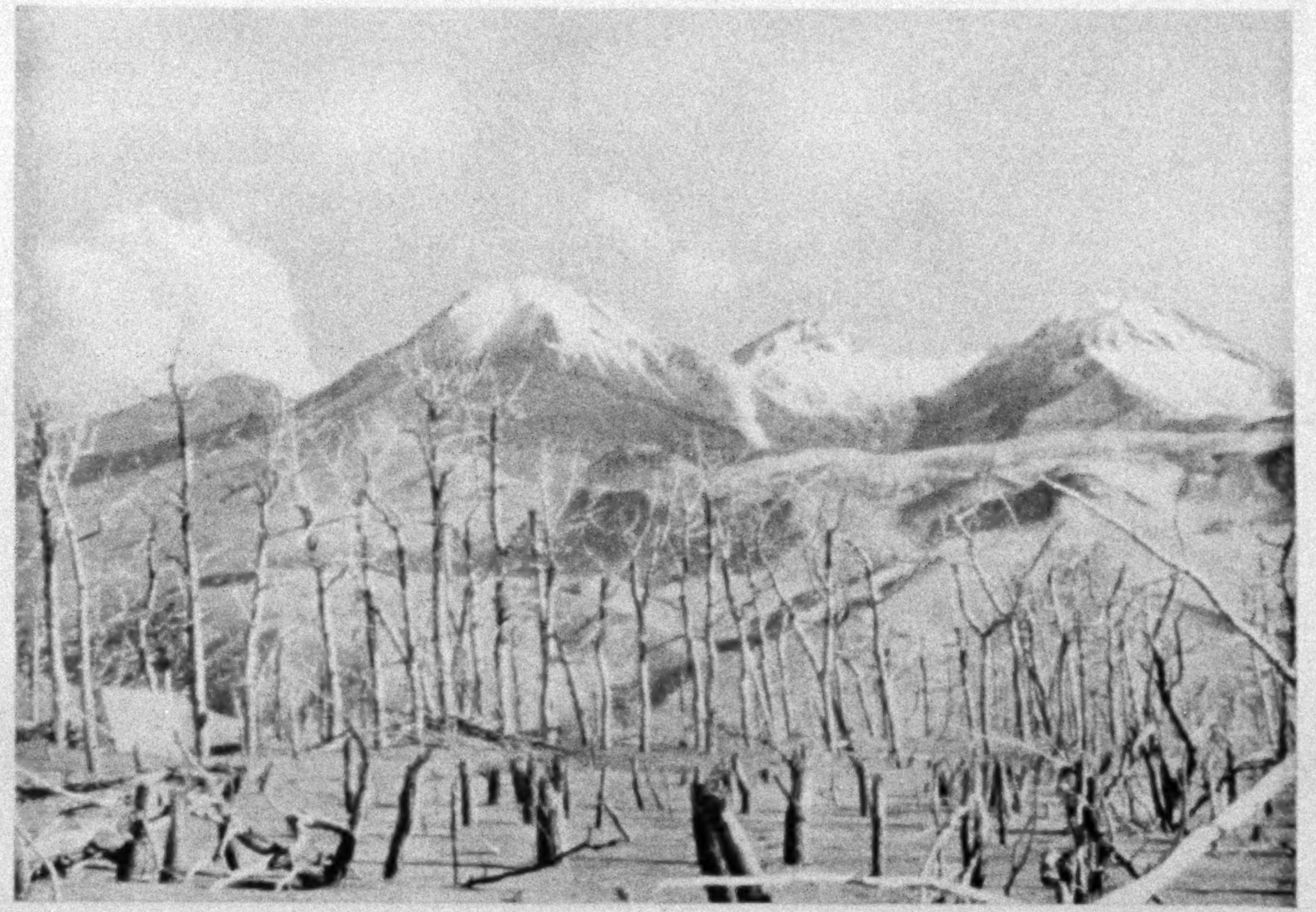
I was anxious to return to Church, for we had already been gone much longer than we had expected when we left him. So, starting to return, I had reached a little eminence, for the fumaroles were just over the pass, when, turning around to urge Folsom to hasten, I saw far down the valley, over the top of some rising ground beyond us, a puff of steam. This had not been there when we came over the pass and was evidently considerably larger than the jets we had been examining, and as the obstructing hill was not far away I decided, late as it was, to go forward and have a look.

THE VALLEY OF THE TEN THOUSAND SMOKES

I can never forget my sensations at the sight which met my eyes as I surmounted the hillock and looked down the valley; for there, stretching as far as the eye could reach, till the valley turned behind a blue mountain in the distance, were hundreds—no, thousands—of little volcanoes like those we had just examined. They were not so little, either; for at such a distance anything so small as the little fumaroles at which we had been warming our hands would not be noticed.

Many of them were sending up columns of steam which rose a thousand feet before dissolving. After a careful estimate, we judged there must be a thousand whose columns would exceed 500 feet (see page 62).

It was as though all the steam-engines in the world, assembled together, had popped their safety-valves at once and were letting off surplus steam in concert. Some were closely grouped in lines along a common fissure; others stood apart.



Photograph by R. F. Griggs

THE TRIDENT FROM THE ISLAND CAMP

The conspicuous column of steam rising behind Trident comes from the "Valley of the Ten Thousand Smokes"

The biggest of all, whose steam had first caught my eye, stood well up on the mountain side, in a nest of fissures which looked like the crevasses of a glacier, and were big enough to be plainly visible, though more than five miles away.

Fortunately a strong wind was blowing across the pass, carrying the fumes all down the valley and away from us, or we might not have dared to go on. In addition to the active fissures, there were thousands more that were quiescent at the time of our visit, but which had encrusted the ground round about with colored deposits like the others. If all of these vents were to be counted, their numbers would undoubtedly reach into tens of thousands.

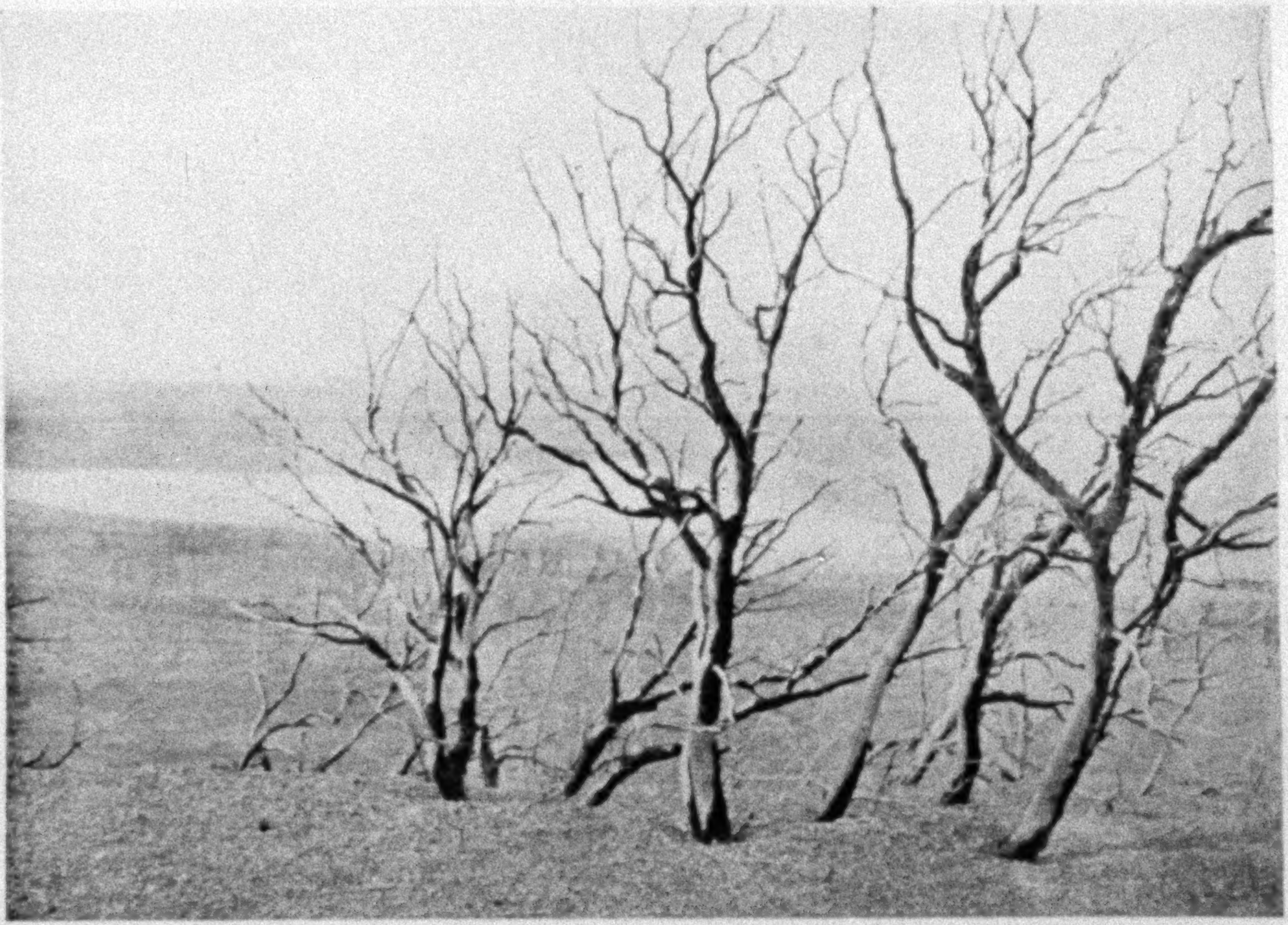
CHARACTER OF THE VENTS

In some cases the orifice from which the steam issued was a large, deep hole; in others there was no opening at all, the steam simply escaping through the interstices of the soil particles. There was no relation between the size of the vent and its output. Some of the largest had no visible opening at all, while from some cavernous holes issued only faint breaths of steam. In many cases steam issued from the sides of the gullies cut by water from the melting snow on the mountain sides where it did not break through the more compact surface layer of mud.

In some places the ground was warm beneath our feet, and had we not been solicitous for our shoe leather doubtless we could have found places as hot as we might have desired.

Although there is every reason to suppose that the vigor of the action is variable, there was in most cases no evidence of explosive action, such as remnants of ejecta around the vent. Most of the steam jets came out of cracks in the level mud floor of the valley. But some, on the contrary, had built up small cones around themselves or formed a small-sized crater by hurling away the ground around the vent.

I wish my vocabulary were adequate to describe the curious mixture of foul



Photograph by D. B. Church

BIRCHES WITH THE BARK CUT OFF BY SAND BLAST

But even such testimony can give one no idea of the terrible severity of the northwest gales. For forty-eight hours one of them bombarded our camp. Every moment we expected the tent to be torn to shreds. We could never have kept it in place had it not been for the floor, which we weighted down when the pegs pulled out. For two nights sleep was impossible, and during the day we could cook no food (see text, page 56).

odors which they gave forth. Mixed with the omnipresent sulphurous gases were others which had a strangely organic smell, recalling at once burning wool, the musky smell of a fox den, and the odors of decay.

We could not tell to what extent, if any, odorless asphyxiating gases, such as carbon dioxide, might be present in the complex. We did not notice any ill-effects from the fumes, but we took good care to keep to windward most of the time.

BRANCH VALLEYS ALSO FULL OF STEAM JETS

Three or four miles down the valley, beyond the mountains next to the pass, we came to a place where lateral valleys come in from both sides at once. Here new wonders awaited us. The southern branch, leading off in the direction of Mount Martin, was full of fumaroles and looked like the main valley. We did not go far enough to see what might lie further up, because of the evident interest of the opposite branch which bore off to the northeast toward Mount Katmai, whose jagged crater walls appeared in full view in the distance.

TWO MORE NEW VOLCANOES OF THE FIRST MAGNITUDE

Up this valley was a prodigious column of steam. As we drew nearer we saw that the main body of this steam was rising from a central mass of rock, surrounded by a comparatively low ring of cinders, the whole extending across the valley and blocking further progress. This I interpret as a plug of lava being slowly pushed up through a vent which was formerly rather violently explosive; so that instead of building a high cinder cone, most of the ejecta were scattered far and wide and only a small ring was formed around the vent.

The surface of the cooling lava plug

was covered in most fantastic fashion with sharp irregular cinders, the result of the too sudden cooling of the molten magma, much in the same way that a piece of melted glass fragments if suddenly plunged into cold water.

Farther on up the valley, on the back side of the isthmus between Katmai and Trident, was another volcano, with a crescent-shaped summit, the side of the crater toward us being open. From this also a considerable body of steam was rising, evidently furnishing part, at least, of the clouds which had excited our suspicions from the other side of the range. Beyond this there may have been yet another volcano, but the rising column of steam from the lava near us obscured the view to such an extent that we could not see clearly.

AN INTERPRETATION OF THE VALLEY OF THE TEN THOUSAND SMOKES

Even the hurried observations we had been able to make were sufficient to bring out distinctly, in its larger outlines, the significance of the phenomenon. It was evident that the valley of the ten thousand smokes is underlain by a great fissure extending northwest from Katmai Pass along the line of the old trail toward Naknek Lake. This might be appropriately denominated the "Naknek Fissure." It is evident that the steam issuing from this fissure and seeping through the mass of accumulations from recent eruptions finds its vent in the myriad fumaroles in a similar fashion to the many small leaks one finds on the surface of an old bicycle tire when there is a single puncture of the inner layer of rubber.

While the main line of this fissure extends up to Mageik, the lateral fissures branch off toward Martin and Katmai. Katmai stands, therefore, like Krakatoa, at the junction of two lines of fissures: one, the Aleutian fissure, which finds its vent in the long line of volcanoes reaching down the Alaska Peninsula and out into the Aleutian Islands, has been long known as one of the greatest lines of volcanic activity on the globe; the other, this newly discovered Naknek fissure, has never been previously recognized and perhaps did not exist before the great eruption of 1912.

That there were no signs of volcanic activity in this direction as recently as 1898 is evident from Spurr's narrative of his journey across the Alaska Peninsula from Naknek to Katmai, which is the only description of the country ever published.

This remarkable valley, like the other volcanic activities of the district, therefore, probably burst forth at the time of the great eruption.

THE RETURN JOURNEY

We had now seen as much as could be observed without extended exploration, so we turned our steps homeward and hurried to rejoin Church, who had shivered for five hours, even with the extra clothes of all three of us. Once across the gullies, which were more than ever a terror to us, now that we were nearly exhausted, we made good speed back to camp, which we reached a little after 10 o'clock.

Here we found that the river, showing the effects of the warm weather on the snow-fields, was beginning to rise so rapidly that we were afraid of being caught miserably on the wrong side. How we wished we could have returned and explored the wonderful valley we had discovered! But we were not equipped for such an undertaking and it was better to get back with what we had than to risk it all for the sake of more. So, hoping that we might be permitted to return and finish the job, we decided on a move, and before 5 the next morning we were up and breaking camp. The event proved that we had lost nothing, for, although the boat to take us back to Kodiak did not come for ten days, only once in that time did the clouds break away again.

Looking back at the work after one has had time to forget the excitement and labor of the daily routine and take a calmer survey of results, the one thing which stands out is the great magnitude of the eruption. Evident from the first reports, this has grown with increasing knowledge. No one, not even those of us who have lived in the desolation of the thing, can form any adequate conception of the stupendous catyclasm that occurred.

This explosion is easily to be ranked among the first dozen known within historic times. Previously Krakatoa has held first place in the minds of most, but the quantity of material thrown out by Katmai was so much greater as to put it into an altogether different class. Indeed, the whole island of Krakatoa could be dropped into the crater of Katmai.

We so inevitably estimate the magnitude of natural phenomena by their effect on human affairs that an eruption like this in an uninhabited district seems unimportant in comparison, for example, with that of Pelee, with its great loss of life. Yet there may have been in the present case tornadoes of hot gas greater than that which overwhelmed St. Pierre and killed 25,000 people; but the destruction by other agencies was so great as to leave little evidence of them if they occurred.

IMAGINE KATMAI'S ERUPTION OCCURRING IN NEW YORK

The magnitude of the eruption can perhaps be best realized if one could imagine a similar outburst centered in New York City. In such a catastrophe all of Greater New York would be buried under ten to fifteen feet of ash and subjected to unknown horrors from hot gases. The column of steam and ashes would be plainly visible beyond Albany, but the continued activity of the volcano would probably prevent any one from approaching for several months to view the ruins nearer than Patterson, N. J.

Philadelphia would be covered by a foot of gray ash and would grope in total darkness for sixty hours. Washington and Buffalo would receive a quarter of an inch, with a shorter period of darkness. Small quantities of ash would fall over all of the Eastern States as far as the gulf coast.

The sounds of the explosions would be heard as far as Atlanta and St. Louis. The fumes would be noticed as far as Denver, San Antonio, and Jamaica.

Not even the most vivid imagination could picture the destruction of life and property which would result from such an eruption in a thickly populated country. We may be profoundly grateful that we have had vouchsafed us such a wonderful opportunity to study the phenomena of volcanoes without any of the horrors usually attendant on their action.

IN VIEW of the extraordinary conditions of the Katmai region, unparalleled anywhere in the world, the Board of Managers of the National Geographic Society has made a further grant of $12,000 for explorations of Katmai during the summer of 1917, the expedition to be in charge of Prof. Robert F. Griggs, who was the leader of the Society's 1915 and 1916 expeditions.

A GAME COUNTRY WITHOUT RIVAL IN AMERICA

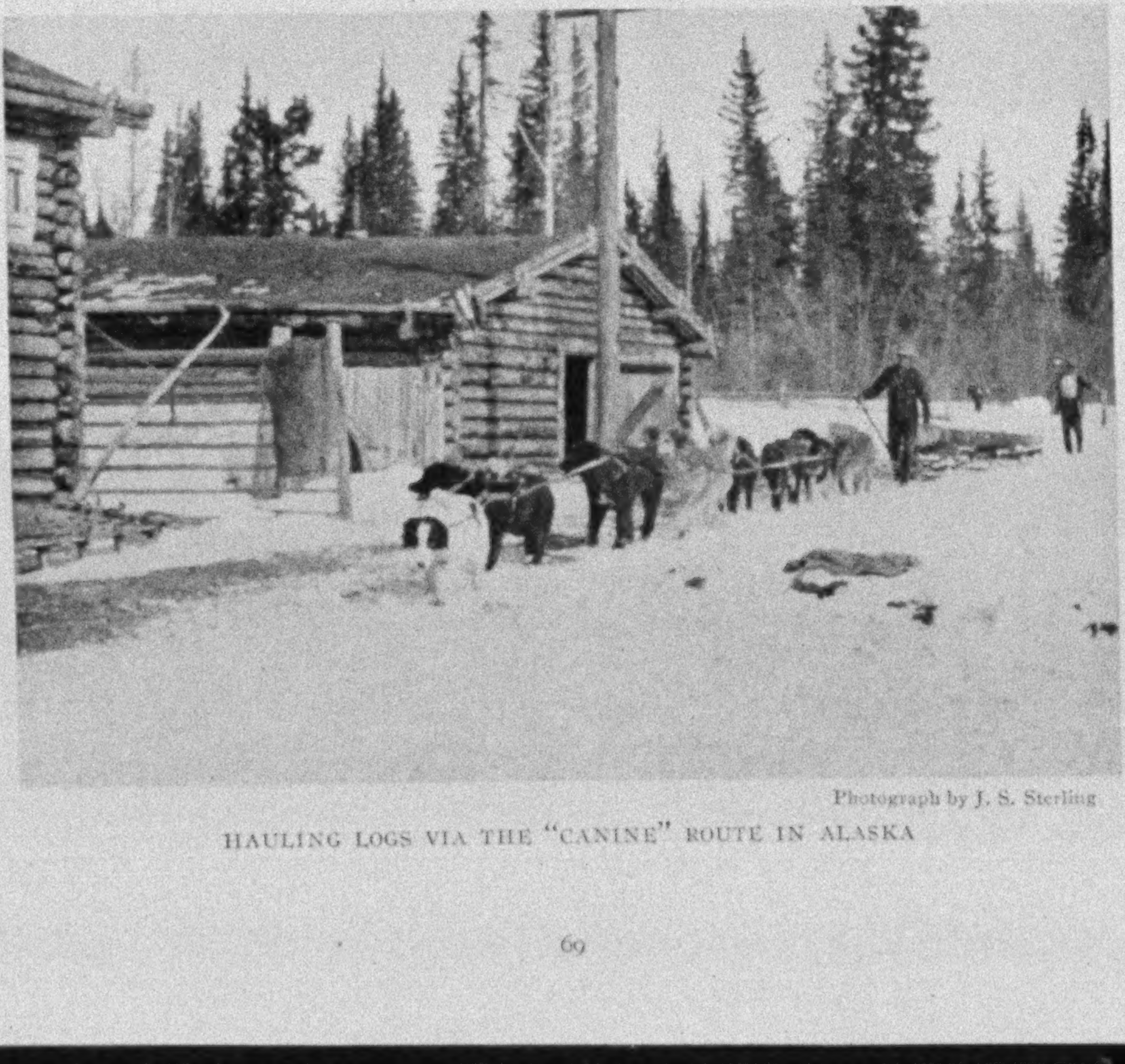
The Proposed Mount McKinley National Park

By Stephen R. Capps, of the U. S. Geological Survey

IN THE spring of 1916 a bill was presented to Congress to establish in Alaska the Mount McKinley National Park. This bill was passed by the Senate during the summer, and its final enactment into law now requires favorable action by the House and the President. Before this article is published the necessary legislation may have been completed and the dream of this new park have become a reality; but in any event every one of us who loves outdoor life should realize what a wonderful country—a country of impressive mountain scenery and big game—we have in that northern territory, and how seriously the wild life of that region is menaced.

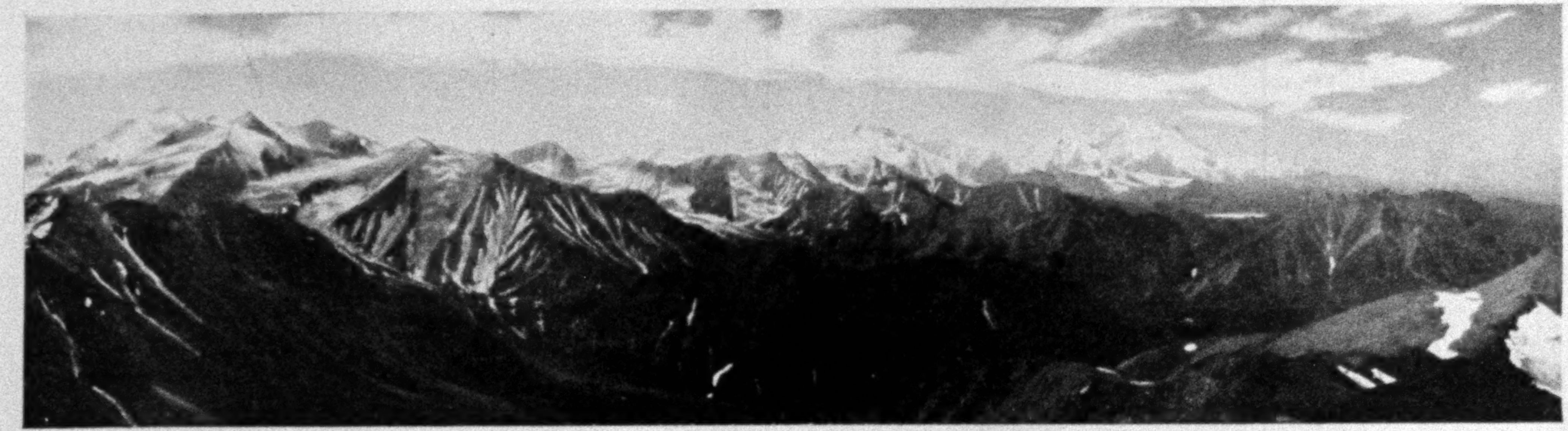
Two parties from the U. S. Geological Survey were detailed to a part of the proposed park in 1916. We proceeded into interior Alaska by the usual route down Yukon River, and disembarked at the new town of Nenana, at which place construction on the new government railroad is in progress.

The 55-mile trip over a little-used trail up Nenana River was eventful enough. We had only a badly damaged and leaky boat to cross that swollen and turbulent stream, and for the better part of a day the horses refused to swim the icy torrent. Then, too, in the forested lowlands the mosquitos surrounded us in clouds. We could protect ourselves with gloves

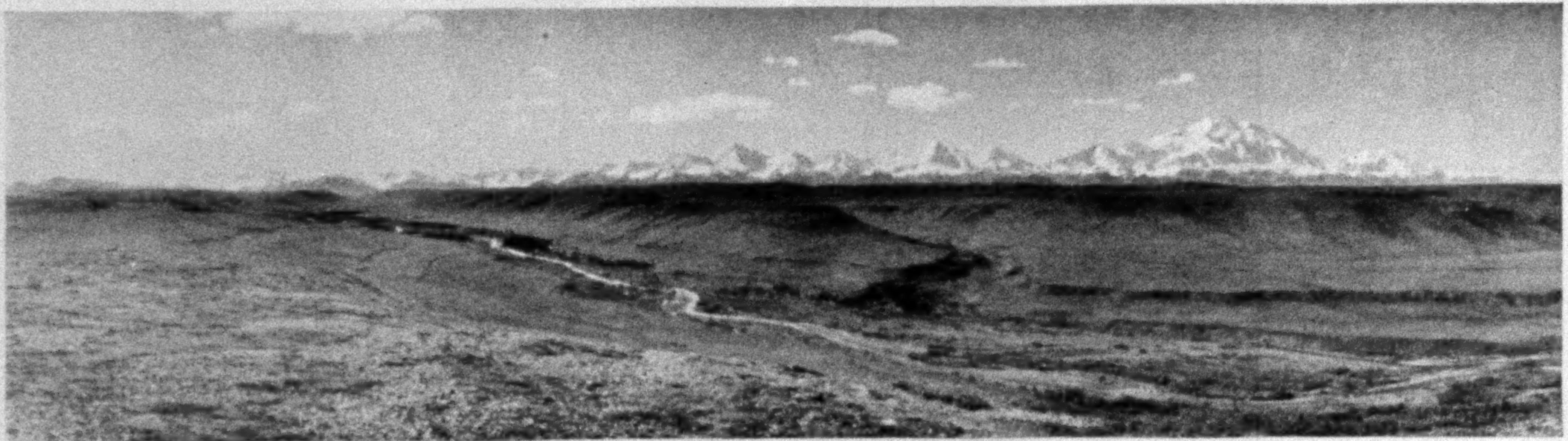


Photograph by J. S. Sterling

HAULING LOGS VIA THE "CANINE" ROUTE IN ALASKA



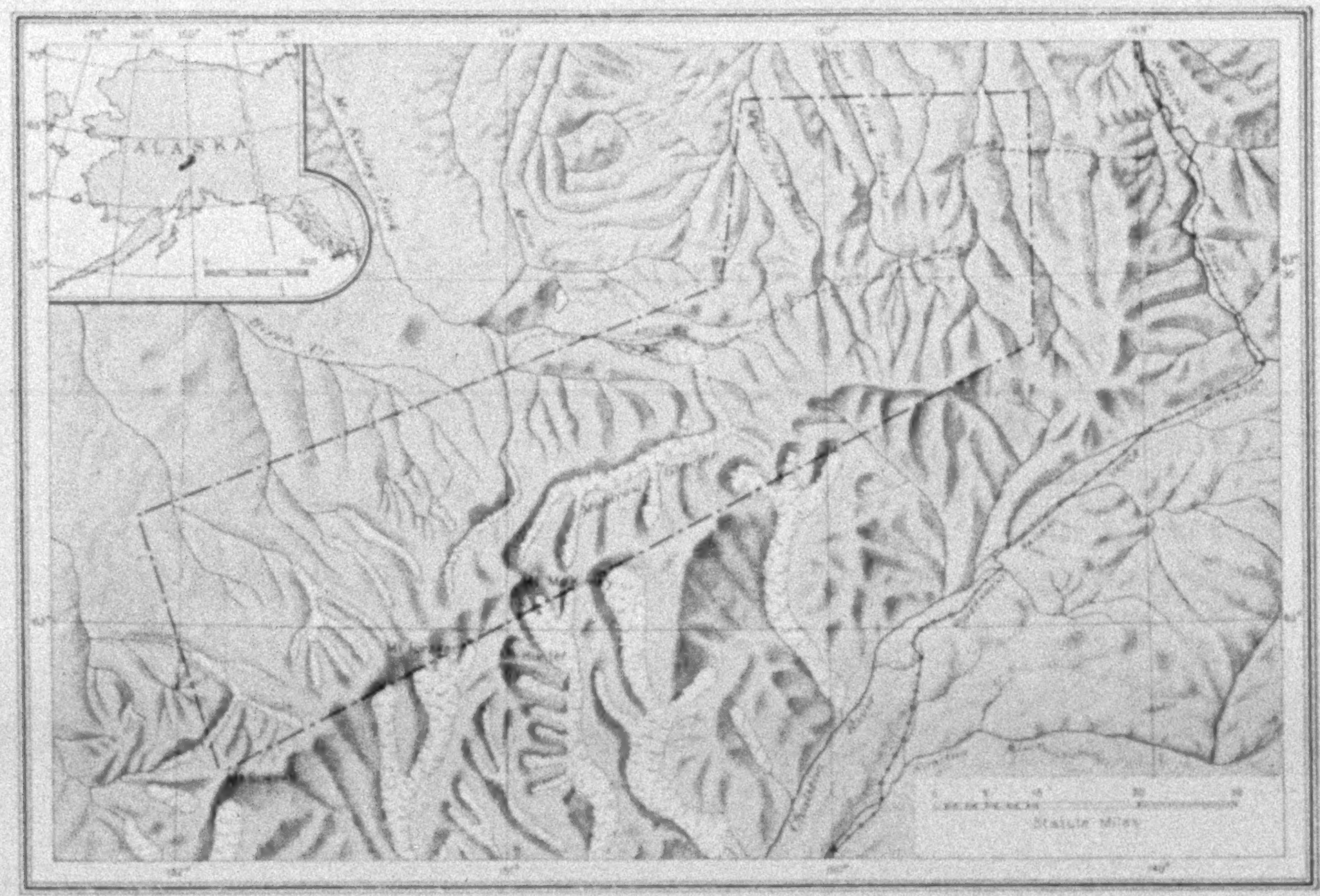
THE STUPENDOUS ARRAY OF SKYSCRAPERS NATURE ERECTED IN THE ALASKA RANGE, VIEWED FROM STONY CREEK



Photographs by C. E. Giffin

THE CREST OF THE ALASKA RANGE, FROM THE FORKS OF MOOSE CREEK: MOUNT MC KINLEY TOWERS ON THE RIGHT

"In scenic grandeur the stupendous mass of which Mount McKinley is the culminating peak has no rival" (see text, page 71)



OUTLINE MAP OF THE PROPOSED MOUNT MC KINLEY NATIONAL PARK, FROM SURVEYS BY THE U. S. GEOLOGICAL SURVEY

and head nets, but the horses were constantly covered with the insects, so that all of them—white, bay, and black—took on the dirty gray color of the mosquitos themselves.

We began our surveys at Nenana River, east of the park, and extended them westward over several thousand square miles.

We had spent only a short time in the field when we discovered that the park had been laid out in a most admirable way. It is true that there is fairly abundant big game and much country of great scenic beauty outside the boundaries, but we entered a game paradise and a land of unrivaled scenery when we crossed the park line. Singularly enough, too, when we were once within the high mountains of the park we left behind us most of the mosquitos, and for a month were almost free from the exasperating attacks of these annoying pests.

When, in the spring, we had first learned of the proposal to establish this park and had plotted its outline on the map, we wondered at its curious shape. Once we were on the ground, the reason for this shape became evident. The long dimension follows the general course of the Alaska Range from Mount Russell to Muldrow Glacier, the park including all the main range from its northwest face to and beyond the summit. East of Muldrow Glacier the range widens toward the north and consists of a number of parallel mountain ridges separated by broad, open basins.

THE HIGHEST CLIMB ABOVE SNOW-LINE IN THE WORLD

There, at the headwaters of Toklat and Teklanika rivers, sheep and caribou range in greatest abundance, and the northern part of the park includes the best of the game country. The reëntrant angle in the park line north of Muldrow Glacier was so placed as to exclude the Kantishna mining district and the hunting ground from which the miners obtain their supply of meat. The total area of this great playground is about 2,200 square miles.

In scenic grandeur the stupendous mass of which Mount McKinley is the culminating peak has no rival. The snow-line here lies at about 7,000 feet, and above

Photograph by C. E. Giffin

VIEW SOUTHWEST FROM THE HEAD OF STONY CREEK, ALASKA: LIKE A CLOUD IN THE DISTANCE, MOUNT MCKINLEY RISES SUPREME ABOVE THE RANGE

that elevation only a few sharp crags and seemingly perpendicular cliffs are free from the glistening white mantle. From the valley of McKinley Fork, which is at the north base of the mountain and lies at an elevation of only 1,500 feet, the bare rocks of the lower mountains extend upward for about 5,500 feet, and above them Mount McKinley rises in majestic whiteness to a height of 20,300 feet—the loftiest peak on the continent.

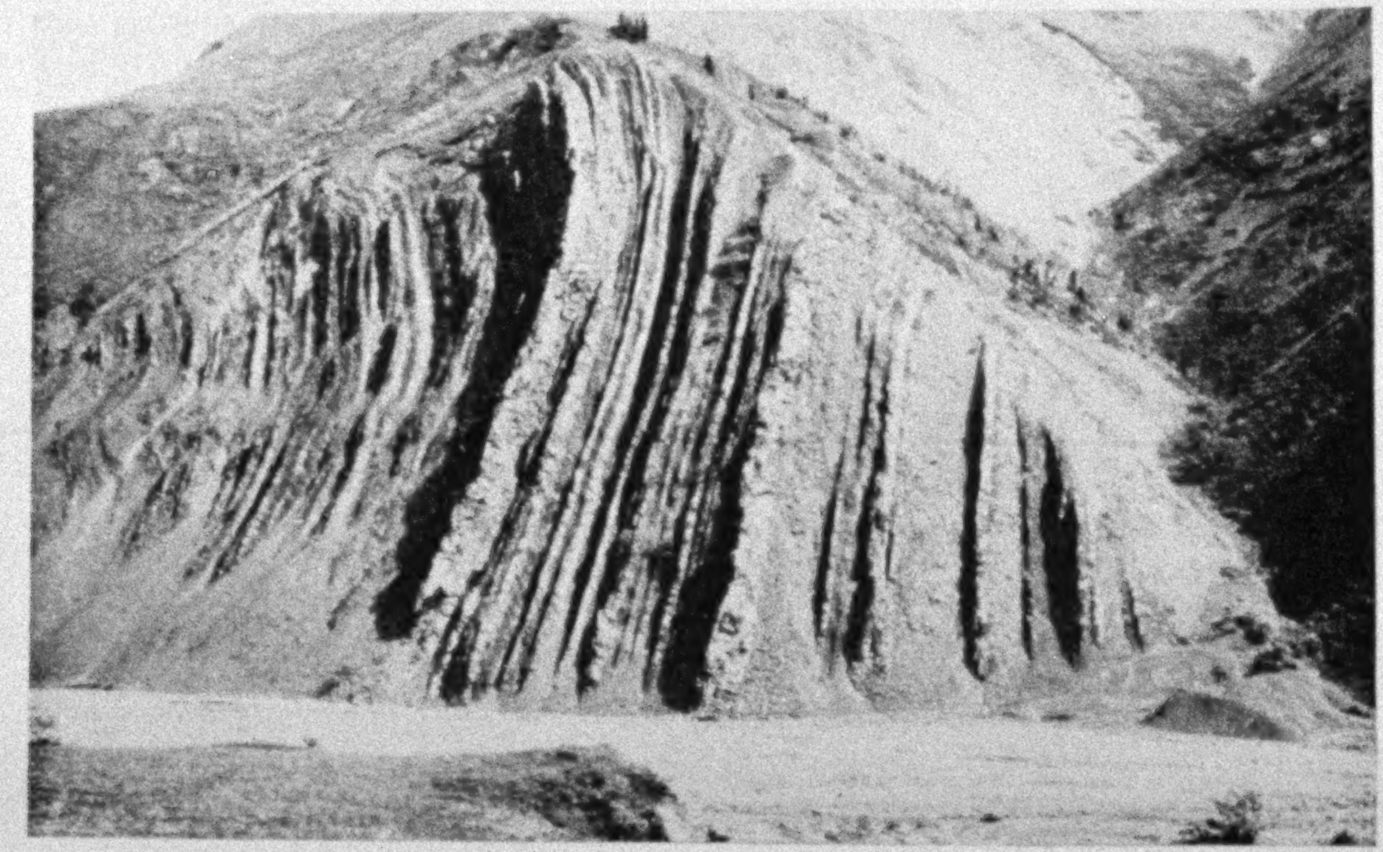
The upper 13,000 feet of the mountain is clad in glaciers and perpetual snows, thus offering to the mountaineer the highest climb above snow-line in the world. The rise of 18,000 feet from the lower end of Peters Glacier, north of the mountain, to the highest peak is made in a distance of only 13 miles. In no other mountain mass do we find so great a vertical ascent in so short a distance. The peaks of the Colorado Rockies, though wonderful, rise from a high plateau, so that at most points from which they can be seen they stand only 7,000 or, at most, 8,000 feet above the observer. Mount St. Elias, an 18,000-foot mountain, may be seen from sea-level, but the peak stands 35 miles from the coast, and so loses in height to the eye by the distance from which it must be viewed.

Similarly the high volcanic peaks of Mexico and South America and the world's loftiest mountains in the Himalayas rise from high plateaus, which diminish by their own elevation the visible magnitude and towering height of their culminating peaks.

THE ARTIST'S COLOR BOX IS SURPASSED

Southwest of Mount McKinley, 15 miles away from it, stands Mount Foraker, only 3,300 feet lower and almost equally imposing. If it stood alone, Mount Foraker would be famous in its own right as a mighty peak, having few equals; but in the presence of its giant neighbor it is reduced to secondary rank.

These two dominating peaks, standing side by side and known to the interior natives as Denali and Denali's Wife, far outrank the flanking mountains to the northeast and southwest, among which, however, there are a score of other peaks that rise to heights between 7,000 and 14,000 feet, well above snow-line, and that are the gathering ground for many glaciers.



Photograph by S. R. Capps

THE MASSES OF SEDIMENTARY ROCKS, NOW STANDING VERTICAL, GIVE A HINT OF THE TITAN FORCES THAT BUILT THE RANGE

Of the glaciers that the tourist will visit in the park, the largest and most accessible is Muldrow Glacier. This ice-tongue, 39 miles long, flows from the summit of Mount McKinley and makes a great fish-hook curve to the northeast and north.

Not the least impressive feature of this part of the Alaska Range is the tremendous scale upon which the foundations of the earth are exposed to view. Especially in the valley heads, where vegetation is sparse or lacking, the high mountain ridges, cut by deep valleys, offer impressive sections for the study of the earth's structure.

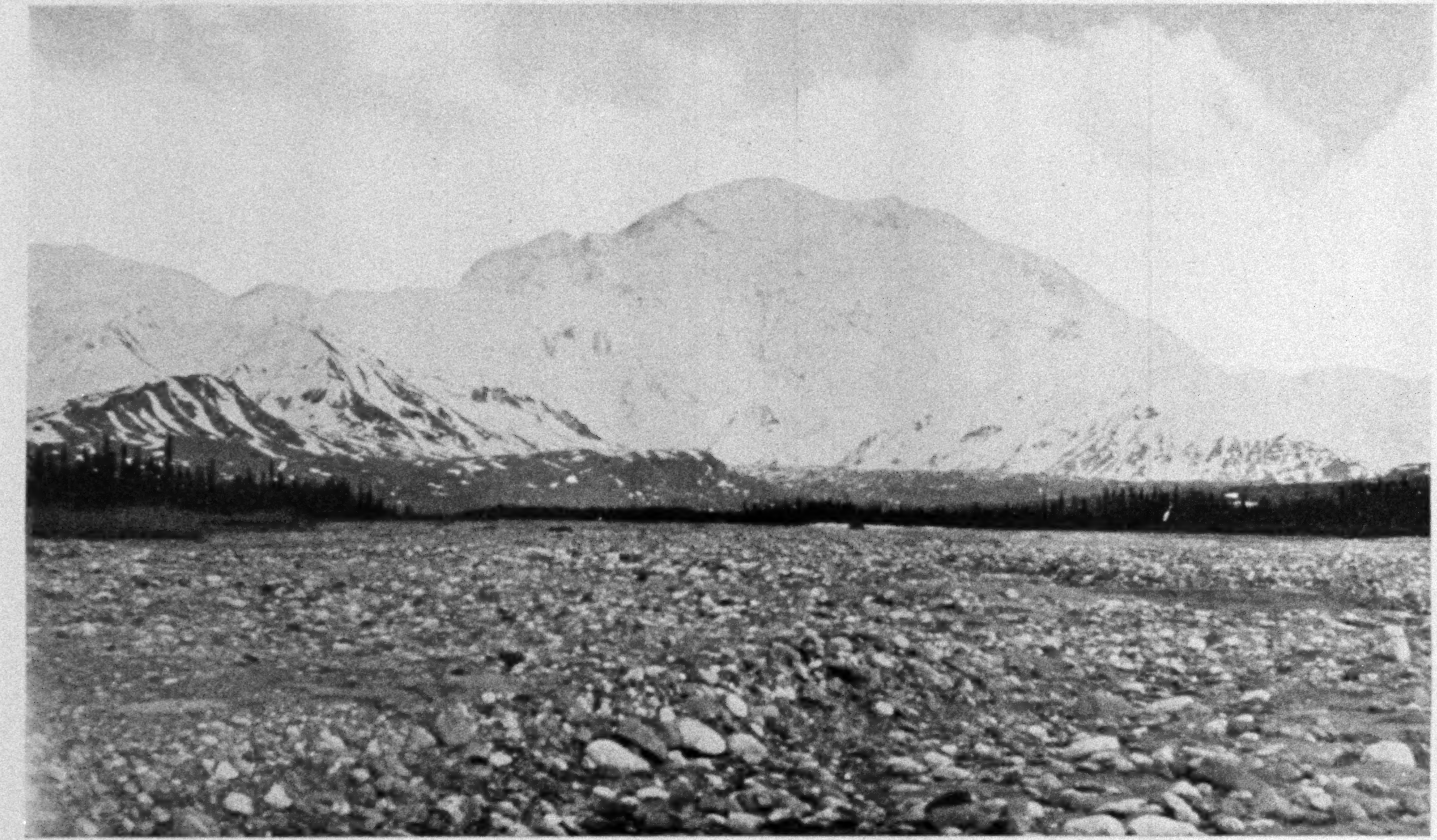
Here great lava flows and volcanic intrusions, in vivid shades of red, purple, brown, and green, will tax the color box of the artist. Masses of sedimentary rocks, first deposited as flat-lying beds, but now standing vertical or twisted into giant folds, give a hint of the Titan forces that build a mountain range.

And near the eastern border of the park, at the Nenana coal field, the traveler can see how Nature, by her generous placing and preservation of coal within the rocks, makes possible the industrial prosperity of our nation by furnishing the fuel needed for its manufactures.

OUR LAST CHANCE

The Mount McKinley region now offers a last chance for the people of the United States to preserve, untouched by civilization, a great primeval park in its natural beauty. Historically this country is new. It was not until 1897 that W. A. Dickey, after having explored in the upper Susitna basin the previous summer, published a description of Mount McKinley, made his remarkably accurate estimate of 20,000 feet as the height of the mountain, and gave it the name it now bears. In 1898 the first actual survey in the neighborhood of the park was made near its east side by George H. Eldridge and Robert Muldrow, of the United States Geological Survey. In 1899 an army expedition, in charge of Capt. Joseph S. Herron, explored a part of the area near the southwestern boundary of the park.

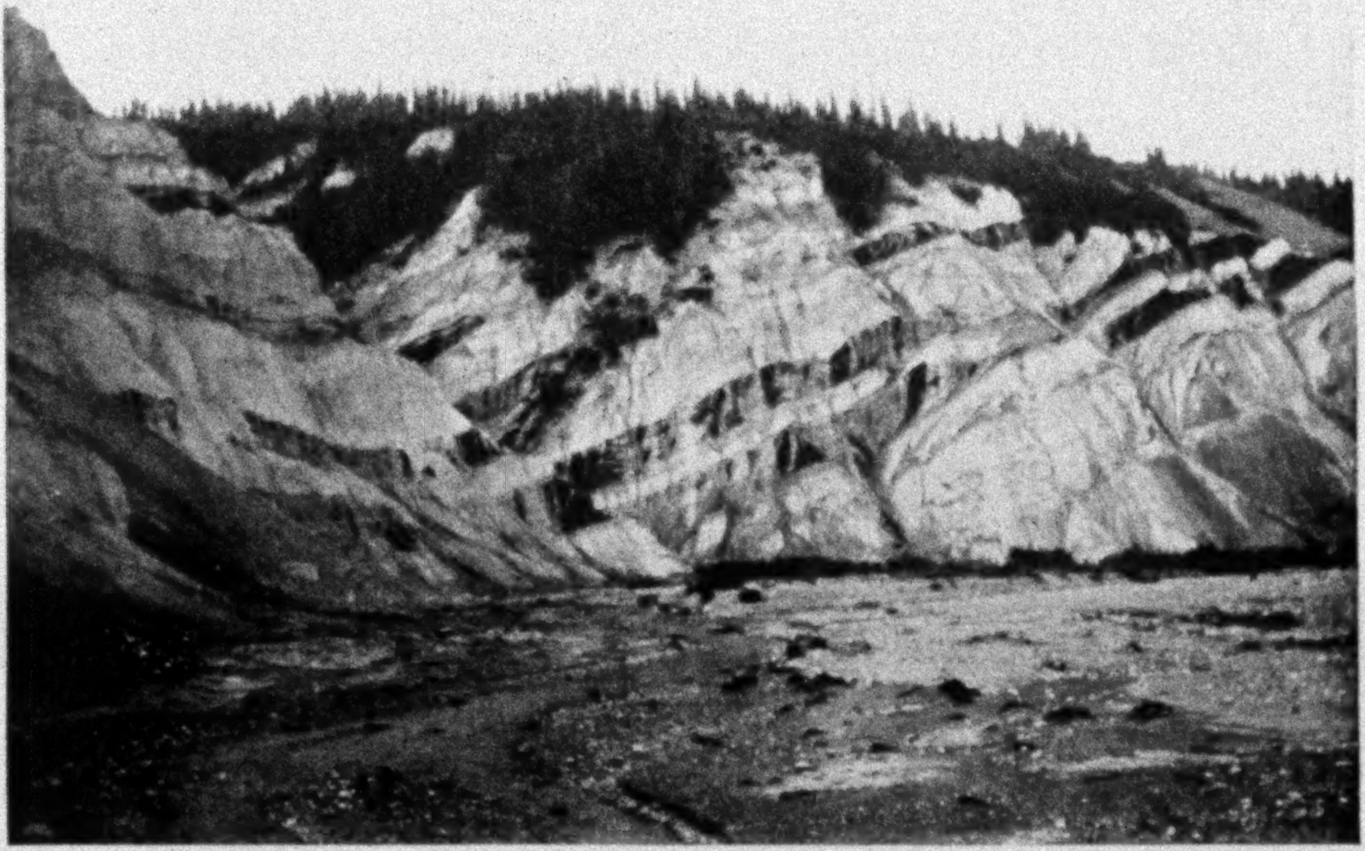
In 1902 the first surveying party that actually reached the vicinity of Mount McKinley was conducted by Alfred H. Brooks and D. L. Raeburn, of the Geological Survey. This party entered the park at its southwest border and traversed it from end to end, bringing out the first authentic information in regard to an unexplored area of many thousand



Photograph from James Wickersham

MOUNT MC KINLEY, THE TOP OF THE NORTH AMERICAN CONTINENT

"The upper 13,000 feet of the mountain is clad in glaciers and perpetual snows, offering to the mountaineer the highest climb above snow-line in the world" (see page 72)



Photograph by Fred Fenton

COAL BEDS NEAR THE EASTERN END OF THE PARK

"At the Nenana coal field the traveler can see how nature, by her generous placing and preservation of coal within the rocks, makes possible the industrial prosperity of our nation by furnishing the fuel needed for its manufactures" (see text, page 73).

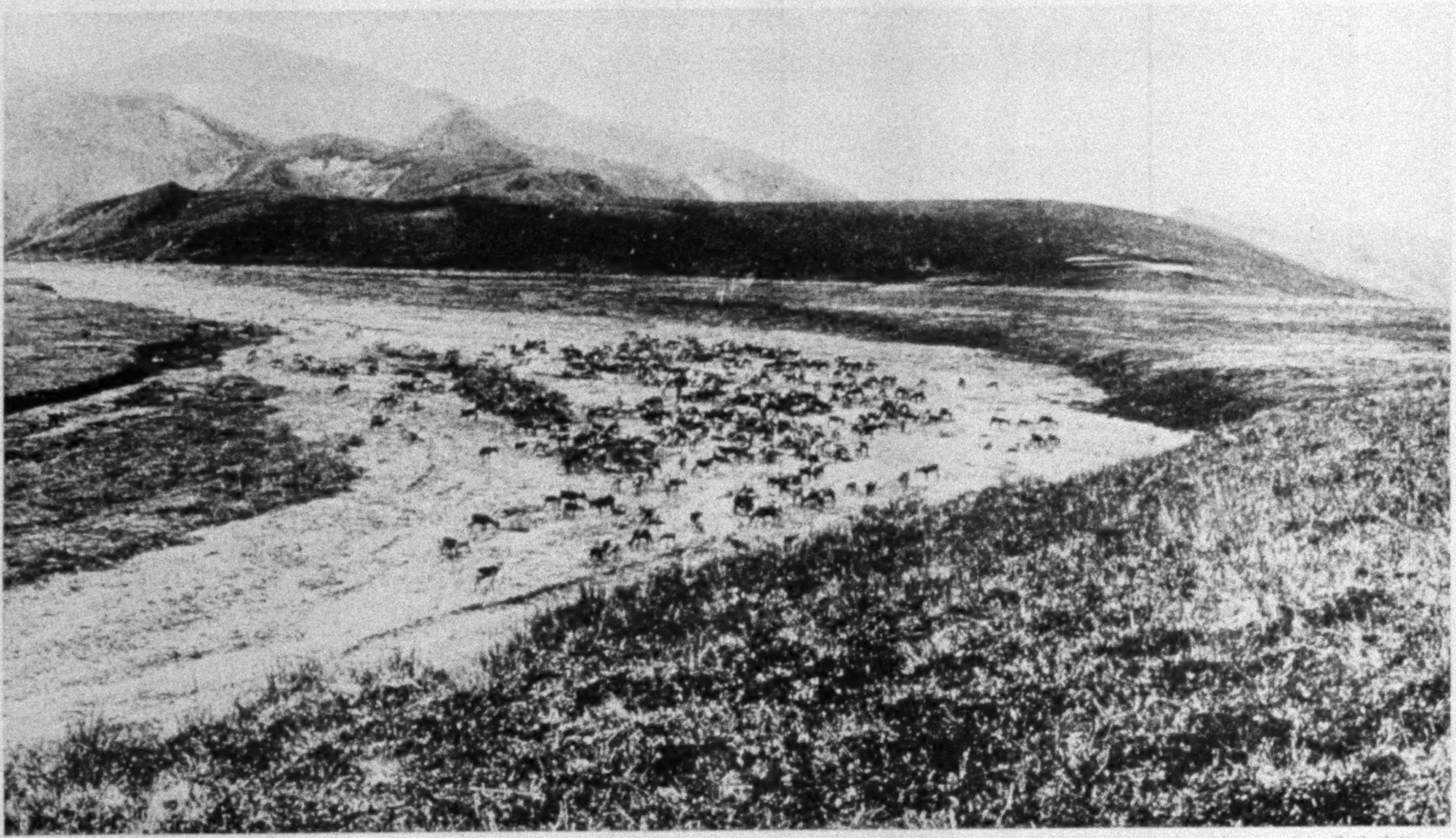
square miles and determining the position, height, and best route of approach to the base of Mount McKinley.

Inspired by the information furnished by the Brooks party, the first attempt to climb this great mountain was made in the summer of 1903 by James Wickersham, now delegate to Congress from Alaska and sponsor for the pending bill to create this great national park. Judge Wickersham's party succeeded in reaching an elevation of 10,000 feet, but a lack of proper equipment and sufficient provisions prevented them from climbing to the summit.

The highest peak remained unconquered until 1913, when, on March 17, Archdeacon Hudson Stuck, Harry Karstens, and two companions left the mouth of Nenana River, traveled by dog sled to the Kantishna district to pick up supplies landed there by boat in the fall of 1912, and proceeded to the basin of Clearwater Fork, at the north base of Mount McKinley. After preparing their own pemmican from wild meat obtained near camp, they began the actual ascent about the middle of April and reached the peak on June 7, 1913. Thus the mountain summit was scaled seventeen years after its first adequate description was published.

A BIG-GAME PARADISE

As a game refuge the new park includes an area that is unique on this continent, and few regions in the world can vie with it. Many parts of Alaska are famous for big game, and hunters have come half around the world to that territory to obtain trophies of their skill. It has been my good fortune to visit several of the choicest game ranges in Alaska, notably that east of Nenana River, adjacent to the Mount McKinley district, and the much praised White River country. Both of these regions are well stocked with game, but for abundant sheep, caribou, and moose over wide areas neither



Photograph by C. E. Giffin

CARIBOU IN THE PROPOSED MC KINLEY NATIONAL PARK: ALASKA

"We counted with the naked eye over a thousand caribou within half a mile of us, and hundreds of others could be seen too far away for accurate count. Most of them were cows and calves or yearlings, but there were a few old bulls, conspicuous for their towering horns" (see text, page 77).

of them compares with the area within the limits of the new game preserve.

The mountains at the head of Toklat and Teklanika rivers literally swarm with the magnificent white bighorn sheep, which are elsewhere extremely wary and difficult to approach, but which in summer are here so little disturbed that they move off only when one comes to close range. A day's travel along one of these valleys will usually afford the casual traveler a view of many bands of sheep. The sheep range on the lower slopes of the mountains, especially in the upper reaches of the streams, near the glaciers at the valley heads, or even in the valley bottoms.

I have counted over 300 in a single day's journey of 10 miles along the river bars, and doubtless as many more were unobserved in the tributary valleys beyond my view. From a single point at my tent door one evening I counted nine bands of sheep, containing in all 171 animals.

The bighorn sheep prefers the slopes of high, rough mountains for its range, and may be found only in the mountains, within easy reach of rugged crags, to which it may retreat for safety from its enemies. Its range, therefore, lies between timber-line and the level of perpetual snow. It is difficult to make an accurate estimate of the number of sheep within the new park, but in the part that we visited there are easily 5,000 sheep, their range extending westward throughout the mountainous portion of the park.

THOUSANDS OF CARIBOU EVERYWHERE

I remember well my first big day for caribou. The pack-train had gone ahead to pitch camp at a prearranged spot near the last spruce timber on the main Toklat, and I was examining the rocks a few miles east of the camping place. Herds of sheep were scattered along the ridges, some feeding on the tender grasses, some sleeping in the sun. I was far above timber-line and my view was unobstructed for miles in all directions. With my glass I had already counted half a dozen solitary caribou, all young bulls, grazing among the stunted willows of the stream flats.

Soon my attention was attracted by a sight unusual in this district—a frightened caribou bull, which was running from the direction in which my pack-train had gone. Soon two yearlings came rushing from the same quarter; then a cow and a young calf in full flight, the cow with tongue out and sides heaving and the calf following closely, but in no apparent distress. Then more came, singly or in twos and threes. Soon a lone calf, lost from its mother, passed close to me, uttering plaintive grunts. As I approached the main river valley from which the frightened animals came, I met the main herd, twenty-five or more, walking slowly up a narrow gulch a hundred yards from me, and apparently unworried by the presence of strangers on their range.

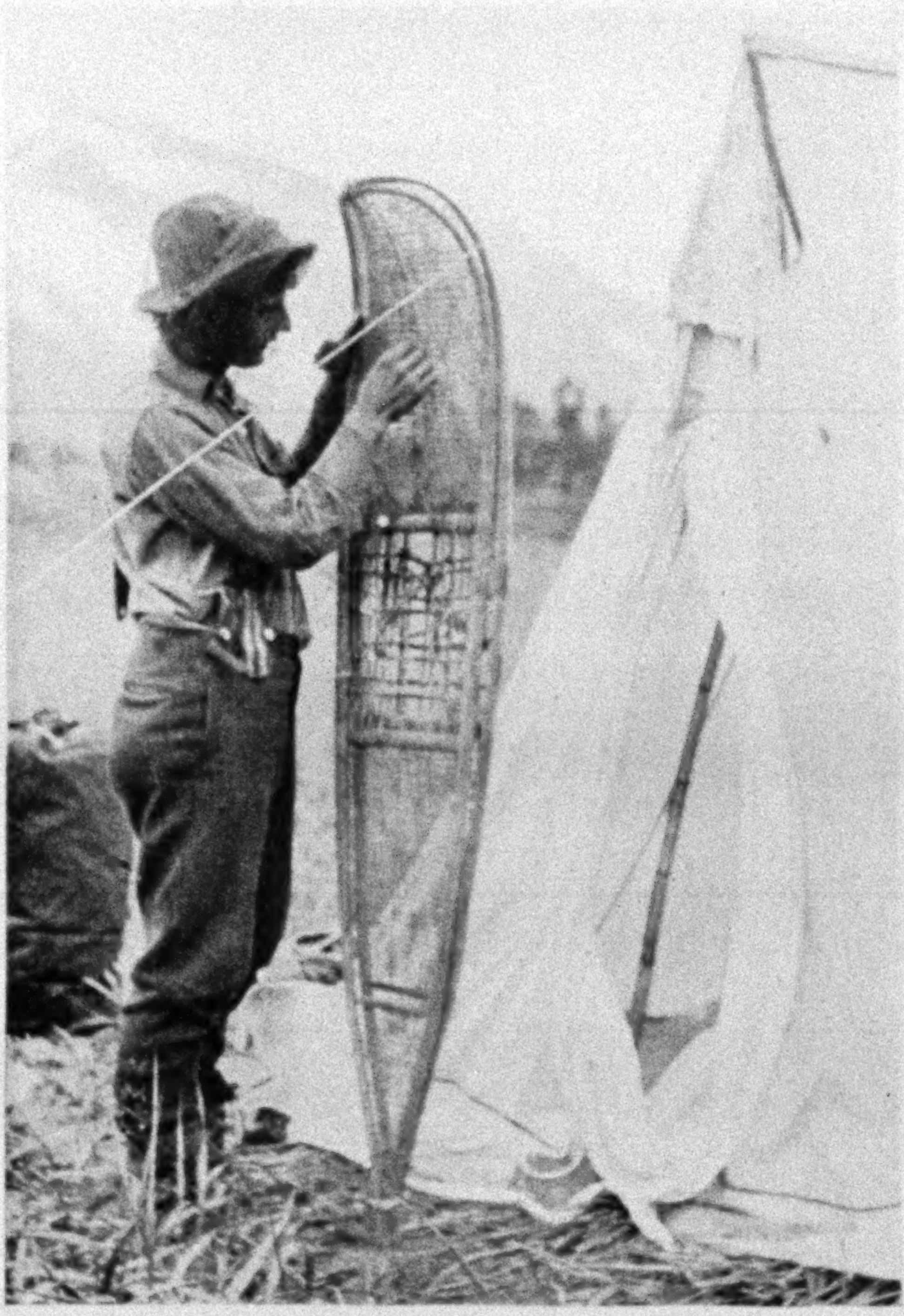
During the next few days I saw more caribou than I dreamed existed in any one locality, including a herd of 200 which was viewed at close range on the Toklat bars. In the pass between Toklat and Stony rivers the two pack-trains and eight men stood in the midst of a vast herd, scattered for miles in all directions.

CARIBOU AVOID THE MOSQUITO PLAINS

We counted with the naked eye over a thousand within half a mile of us, and hundreds of others could be seen too far away for accurate count. In order not to exaggerate, even to ourselves, we estimated the number in sight at one time as 1,500, and I believe that this is an understatement of the number actually there. Most of them were cows and calves or yearlings, but there were a few old bulls, conspicuous for their towering horns. During the following week we constantly saw herds of caribou, some of them numbering hundreds.

Most of these herds were on the bare gravel bars, where the strong winds afford some relief from the attacks by flies and mosquitos. Other herds were high on rugged mountain ridges, and several large droves were observed far up on the glaciers, well toward snow-line, seeking a little respite from insect pests.

In other parts of Alaska caribou at times appear in huge droves as they migrate from place to place, but they stay



Photograph from Dora Keen

SIX-FOOT YUKON SNOW-SHOES

For breaking a trail or crossing wide crevasses they are the ideal type, but for climbing steep slopes or traveling where they have to be carried considerable distances they are too long and cumbersome.

only a short time in any one locality. In the Toklat basin and in the vicinity of Muldrow Glacier, however, the caribou are at home, and they remain there throughout the summer to rear their young.

DIFFERENCES IN ANIMAL BEHAVIOR

There is abundant indication that this is a permanent range. Deeply worn trails form a veritable labyrinth along the stream flats, and bedding grounds, old and new, occur everywhere. The miners from the Kantishna report that caribou may always be seen in great numbers on this range.

There is a striking difference between the actions of caribou and those of the bighorn sheep when surprised by man. A sheep, once aroused, knows exactly where he wants to go, and usually starts, without a moment's hesitation, on the shortest route to some rugged mountain mass. He may stop to look around and appraise the danger, but he is sure to follow the route he first chose.

By contrast, the caribou appears a foolish animal; he seems at a loss to decide whether it is necessary to run away at all. Then, when convinced that danger threatens, he has difficulty in making up his mind which way to run. He has sharp eyes for any moving object, but evidently refuses to trust his sight until his nose confirms his sense of danger.

I have many times seen a caribou, after he has discovered me at a distance of no more than 100 yards, stand and look, snort, lower his head half a dozen times, then run wildly off for a short distance, turn back toward me, repeat the same maneuvers, and make several false, zigzag sprints, all within easy gunshot, before he finally ran to leeward, got the man scent, and started off for good in great panic. In this region, with proper caution and a favoring wind, one can approach within 200 yards or less of a band of caribou, even in the open, before they take alarm and move away.

MOOSE ARE WARY ANIMALS

Moose are very plentiful in certain parts of the new park, but are not so commonly seen as sheep and caribou. As their food supply consists of willow and birch twigs and leaves and the succulent roots of water plants, they stay much of the time in timbered and brushy areas, where they are inconspicuous. By nature, too, the moose is a wary animal and permits much less familiarity than the caribou.

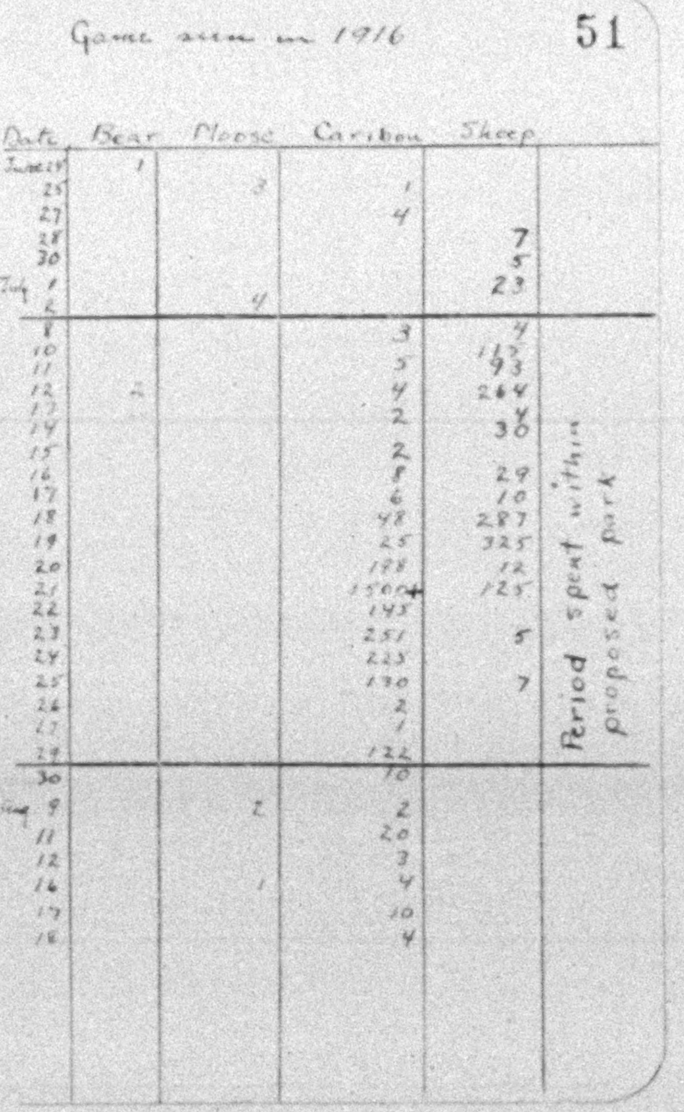
The best moose country in this region lies in the lowlands north of the main Alaska Range, outside of the boundaries of the proposed park; but some moose were seen within the park lines, and doubtless more of them will take refuge in this game preserve when they are more vigorously hunted in the neighboring regions. It is said that there is an excellent moose range within the park, in the area southwest of that which we visited.

There are some black, brown, and grizzly bears in this district, but the bear hunter has a much better chance of obtaining a hide in other parts of Alaska than he has here. All told, only eight bears were seen by the members of the two survey parties during the last summer, and bear sign was so little noted in this region that it cannot be considered an especially good bear country.

The park contains good trapping grounds for the fur hunter, and a number of trappers spend part of each winter there. Foxes are plentiful, and an unusually large proportion of the pelts taken are of silver gray or black fox. One trapper told me that in Toklat basin the winter's catch for a number of years has yielded one silver gray fox skin for every eight foxes caught, and of the remaining seven, several are likely to be good cross-fox. We saw a good many foxes and found two dens around which young ones were playing. Lynx are also plentiful, and numerous mink, marten, and ermine have been taken.

MANY AND BUSY BEAVERS

Beaver were seen in the park, but are exceptionally abundant in the marshy lowlands north of it. On our trip down Bearpaw River, in the fall, while we were on our way to Tanana, we saw everywhere along the banks signs of beaver. Freshly cut cottonwood and willow trees lie along the shores, and the trails used by the beaver to bring sections of trees down the banks were seen at short intervals.



Game seen in 1916

51

Date	Bear	Moose	Caribou	Sheep	
June 24	1				
25		3	1		
27			4		
28				7	
30				5	
July 1				23	
2		4			
8			3	4	Period spent within proposed park
10				113	
11			5	93	
12	2		4	264	
13				4	
14			2	30	
15			2		
16			8	29	
17			6	10	
18			48	287	
19			25	325	
20			198	12	
21			1500+	125	
22			145		
23			251	5	
24			225		
25			190	7	
26			2		
27			1		
29			122		
30			10		
Aug 9		2	2		
11			20		
12			3		
16		1	4		
17			10		
18			4		

A PAGE FROM THE AUTHOR'S DIARY, SHOWING GAME SEEN IN AND NEAR THE PROPOSED PARK (SEE TEXT)

Night after night we would hear the sharp splash of the swimming animals as they whacked their tails upon the surface of the stream. Beaver are protected by law until 1920, and under this protection have greatly increased in numbers. In the lowlands they have so much obstructed all the smaller streams with their dams that foot travel overland is impossible until ice forms.

In order to give the reader an idea of the abundance and variety of game to be seen by the traveler in the Mount McKinley Park, I am showing above a photograph of a page taken from my diary, in which I each day made record of the big-game animals I saw. In making my

Photograph by R. B. Murray

A TRAPPER'S RELIEF CABIN UP IN THE HILLS: ALASKA

"Every one of us who loves out-of-door life should realize what a wonderful country—a country of impressive mountain scenery and big game—we have in the northern territory, and how seriously the wild life of that region is now menaced" (see text, page 69).

count I was perhaps overmoderate, for if in a trip up a valley I saw 90 sheep, and on my return by the same route I saw the same number, I added nothing to my count, presuming that the sheep last seen were the same as those counted earlier in the day. Thus while traveling among herds of animals that were in constant movement from one feeding ground to another I may have failed to make record of many new herds that came into sight, because I was not sure they were new herds. The same practice was followed in counting caribou.

GAMELESS DAYS ARE RARE

An examination of that diary or record, which was made from day to day in the field, shows how wisely the park lines were established so as to include the best game ranges. Until July 8 we were outside the park, and although we were in a good game country, we saw comparatively few animals on any one day, and on some days none. Our crossing of the park line was coincident with a remarkable increase in the number of animals seen, and afterward there was a steady succession of days in which game was sighted.

The decrease in numbers on July 26, 27, and 28 was due not to a paucity of game in that part of the park, but to a violent rain-storm that kept us in camp. Even then we had only one gameless day, for our record was kept almost unbroken by caribou that passed close to our tents on two of the three bad days.

I have tried to make plain the fact that the area within the proposed national park is a game country without rival in America. That is certainly true today, but unless this game refuge is immediately reserved a few years may see these great herds destroyed beyond hope of reestablishment. Even today the encroachments of the market hunter are serious. True, there are game laws in Alaska, but they are by no means everywhere strictly enforced, and many sled-loads of wild meat are carried into the towns during the winter. The town of Fairbanks,

IN A TRAPPER'S CAMP: ALASKA

Part of a winter's catch, consisting of 74 lynxes (hung in bunches), eight foxes (one silver, four cross, three red); also (hung in center) 54 rabbits, shot in 45 minutes by three rifles while driving through the willows on an island during the winter.

about 100 miles away from the new park, and the largest settlement in the interior, is the destination of most of the wild meat killed on the north side of the Alaska Range. The mountains just south of Fairbanks and east of Nenana River offered a convenient field for the market hunter, and for years large numbers of mountain sheep were killed there for the Fairbanks market.

THE POT-HUNTERS' DESTRUCTIVE TOLL

Within the last few years, however, the sheep herds in the nearer mountains have become so depleted that the hunter has been forced to go constantly farther from his market, and now finds the most satisfactory hunting ground within the limits of the proposed reserve.

I talked with several men who take sheep meat to Fairbanks for sale, and one of them estimated that each winter for the last three years from 1,500 to 2,000 sheep have been taken from the basin of Toklat and Teklanika rivers. Only a part of these reaches Fairbanks, for the sled dogs must be fed during the hunt and on the trail, and some hunters leave behind all but the choicest hind quarters.

It can be readily seen that slaughter on such a scale can last only a short time, until the game here, too, has been nearly exterminated. The sheep, being of choicest flavor, are taken first, but the moose and caribou will not escape after the sheep become harder to get.

The absence of a supply of wild meat in Fairbanks and other interior towns will work no hardship on the residents, for there is already a well-established trade in refrigerated domestic meat, and the dealers will readily supply all the fresh meat for which there is a demand, and at a cost little, if any, above that charged by the market hunters for game.

A BIG-GAME PARADISE 15 MILES FROM A RAILROAD

Such are the conditions today, even in a region so difficult of access. How much more rapidly will the game disappear when the railroad is completed to a point

Photograph by Thomas Riggs

HEADED FOR THE ANNUAL CARIBOU HUNT

Charley Blackfox and family off for the hills. The poles are tent poles, as the hunting will probably be well above timber-line. Note the packs on the dogs.

within 15 miles of this game paradise! The establishment of a town at Nenana, where the railroad crosses Tanana River, has even now brought a market for game some 50 miles nearer the sheep hills of the Toklat.

Already homesteads have been taken up along the railroad, and in a few years this untouched wilderness will hear the sound of the mower and the clatter of railroad trains. If the park is established now, the game can be saved and will remain for other generations to enjoy. If action is postponed a few years, the market hunter and sportsman will have done their work and the game will have gone forever.

Most of the larger streams of the park, heading as they do in glaciers, are so muddy that fish will not live in them. All of the smaller tributary creeks that carry clear water, however, are stocked with grayling and furnish excellent fishing. The grayling, a relative of the trout, is a game fish, rises well to the fly, and affords excellent sport. In texture and flavor it compares well with the trout and is a welcome addition to the menu of the camper.

As will be seen from the photographs, the new park lies almost entirely above timber-line. Trees grow along the valleys of the main streams to an elevation of about 3,000 feet above sea-level, but the timbered areas comprise only a small fraction of the whole. The only trees of importance are the spruce, birch, and cottonwood, and none of these are large. The best patches of trees afford logs big enough for making log cabins, but there is no merchantable timber in the park. Willow brush and some alders grow somewhat farther up the valleys than the trees and enable the camper to find fuel for his fire in some areas where trees are lacking.

THE PARK IS EASILY ACCESSIBLE

On the completion of the new government railroad, now under construction, the park will immediately become accessible. The railroad line runs within 15 miles of the east park line. On leaving Seattle one can then plan to reach Seward or Anchorage within a week, spend a single day on the railroad to the park station, and in another day or two, by saddle-horse, penetrate well into the park and into the midst of its game herds.

With a completed wagon road built from the railway, it should be an easy half day's journey of 80 miles by automobile from the railroad to the center of the park, the whole route traversing mountains of wonderful scenic beauty and teeming with big game.

At the western terminus of the wagon road there will some day be a hotel for the accommodation of tourists and mountain climbers. There, below the terminus of Muldrow Glacier, in constant view of the mighty snow-clad monarchs to the south, one will be able to find complete rest in the grandest of natural surroundings, or will have close at hand tasks of mountain-climbing that will tax the resources of the sturdiest. Few regions offer the inducements to the mountaineer that can be found here.

The highest point of Mount McKinley, the lord of the range, has been scaled but once, and only one route on that vast icedome has been explored. Mount Foraker, only less majestic than McKinley and 17,000 feet in elevation, is still unconquered, and associated with Foraker and McKinley there are many peaks that rise from 4,000 to 8,000 feet above the line of perpetual snow (see pictures, page 70).

All this great group of noble mountains, until now so remote as to be impossible of attack except by elaborately prepared expeditions, will be easily accessible to even the modestly equipped explorer. The main highway of travel through the park will pass within 20 or 30 miles of the highest mountains. Thus that bugbear of the climber in so many regions—the task of getting within striking distance of his chosen peak—is here a matter of no great difficulty.

So much for the park itself—its marvelous advantages as a national reserve, its unequaled scenic beauty, and its abundance of big game. I have tried to tell something of what is there for the people of the United States, to be had merely for the taking. The question may be asked, "How necessary is it that this park should be reserved immediately, rather than at some indefinite date in the future? Is there any danger that the park will not keep, even if not reserved?"

Photograph by Curtis & Miller

AN EDUCATED BEAR AT ST. MICHAEL

The answer is plain and admits of no argument. The scenery will keep indefinitely, but the game will not, and it must be protected soon or it will have been destroyed.

WILL IT PAY?

Considered as a purely business measure, without taking account of the esthetic value of such a permanent national reserve in its influence on the development of the American people, the Mount McKinley National Park will be a tremendous financial asset to the territory of Alaska and to the United States as a whole.

Prodigal as nature has been in endowing us with unrivaled scenery, we have until recent years been blind to the money value of this resource. Other nations not so blessed with fertile soils, vast forests, and mines of almost fabulous value have widely advertised their natural beauties in a way to attract the tourist, so that for years American travelers have spent abroad millions of dollars that might have yielded them no less pleasure if they had spent it in seeing America first. The good roads, well-equipped hotels, and beautiful mountains of the Swiss and Italian Alps attract the traveler like a magnet. Even our nearer neighbor on the north, by judicious advertising and careful attention to the comfort of the traveler, attracts great numbers of our people to her western mountains.

If the United States wishes to share in the profits of the tourist business it may readily do so, for any well-chosen expenditure made in building good roads and hotels in our national parks will return large dividends not only in dollars and cents, but in the health, enjoyment, and education of our people. And the traveling public will soon learn that one of the grandest of our parks, one of those most worth visiting, is that which, let us hope, is soon to be established in the Mount McKinley region.

ONE HUNDRED BRITISH SEAPORTS

WITH a deadline of 1,600 nautical miles to guard, measured from headland to headland, 20 miles offshore; with 119 ports, large and small, to seal up, 80 of which, even at low tide, are open to vessels that can navigate 14 feet of water; with a larger number of bays and other navigable indentations to watch than are to be found anywhere else in the world in the same length of straightaway shorelines, Germany's plan to blockade the British Isles seems as near a proposal to accomplish the impossible as anything to which any nation hitherto has committed itself.

Indeed, undertaking to combat at once the sinuosities of a shoreline lending itself better to defense against blockade than any other of equal length in the world and the greatest navy civilization has ever seen, it is difficult to imagine how success could even be hoped for by those putting the plan into execution.

Something of the extraordinary indentations of the shoreline of the United Kingdom may be gathered from the map on page 85.

England is so deeply indented that no part is more than 75 miles from the sea, while Scotland has the most rambling coastline of any country in the world.

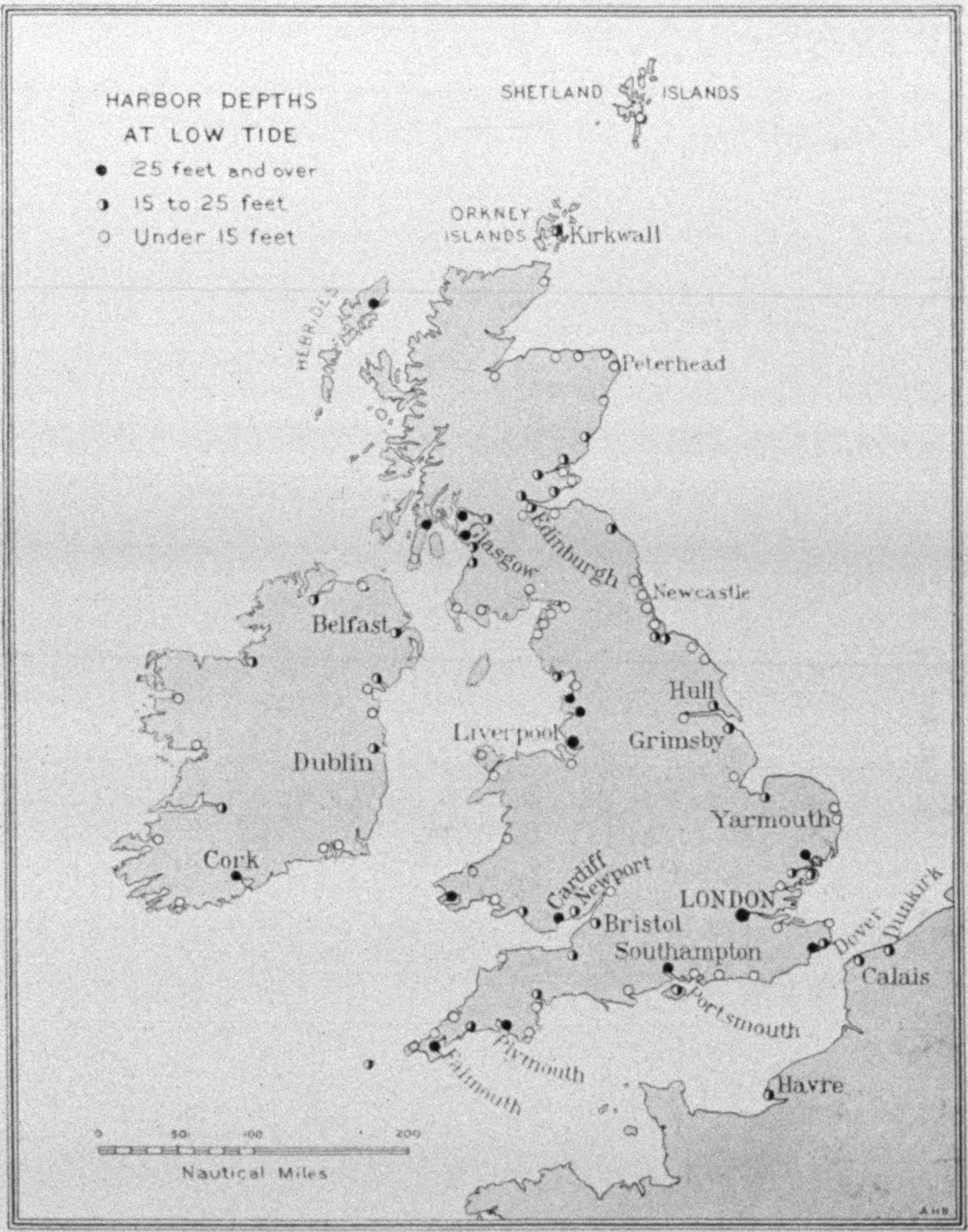
Ireland is not as deeply indented as England and Scotland; but with all that it has shores that make the way of the blockader difficult.

The vast proportions of the British shipping industry which the German submarine blockade is attempting to destroy defies our comprehension. In normal years an average of 214 ships arrive at United Kingdom ports from foreign waters every day in the year. In addition to that, there are 780 arrivals from home ports every day in the year of ships in the coastwise trade.

British merchant ships have a greater aggregate tonnage than those of all the other countries of the world together. The merchant marine of that nation includes nearly 12,000 ships of all kinds. Of these, about 2,800 are sailing ships and 5,300 steam vessels employed in the home trade. There are approximately 4,000 ships engaged in sailing between British and foreign ports. These latter have an average capacity of more than 2,500 net register tons.

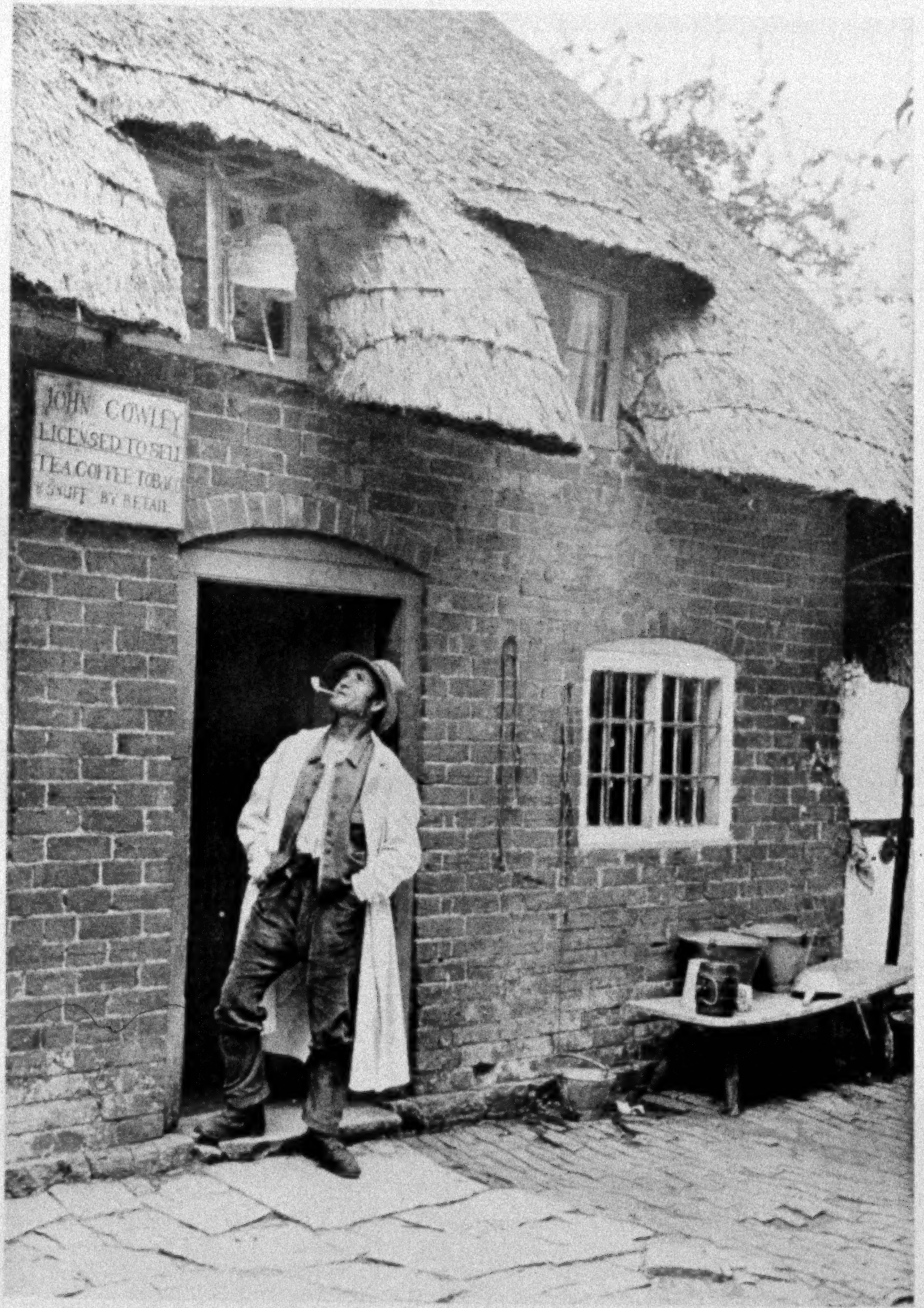
How rapidly Great Britain has been replacing the losses sustained by her shipping as a result of Germany's submarine attacks is disclosed by the fact that at the end of 1916 there were 465 steam vessels under construction in British shipyards, more than half of them being ships of more than 5,000 tons burden. The aggregate capacity of these ships is 1,788,000 tons, so that both in tonnage and in number the new craft are replacing those sunk by the enemy.

Few countries in the world are so dependent on the importation of foodstuffs as the United Kingdom, and for her not


HARBOR DEPTHS AT LOW TIDE
● 25 feet and over
◑ 15 to 25 feet
○ Under 15 feet
SHETLAND ISLANDS
ORKNEY ISLANDS
Kirkwall
HEBRIDES
Peterhead
Glasgow
Edinburgh
Newcastle
Belfast
Liverpool
Hull
Grimsby
Dublin
Yarmouth
Cork
Cardiff
Newport
LONDON
Bristol
Dover
Dunkirk
Southampton
Calais
Portsmouth
Plymouth
Falmouth
Havre
0
50
100
200
Nautical Miles
A H B

SKETCH MAP INDICATING THE MULTITUDE OF BRITISH HARBORS

The United Kingdom and Ireland contain 119 seaports, of which 80, even at low tide, are open to vessels drawing 14 feet of water. At average tide they will admit vessels requiring much greater depths. The seas surrounding the islands are very shallow, making it easy to anchor mines to destroy shipping and also to moor nets to trap submarines. If the waters of Dover Strait were to subside 100 feet, an isthmus would connect England and Holland. If the waters subsided 300 feet, Ireland and the whole of the British Islands would once more be connected to Continental Europe.


JOHN COWLEY
LICENSED TO SELL
TEA COFFEE TOBAC
& SNUFF BY RETAIL

Photograph by A. W. Cutler

A RURAL CONVERSATION IN THE HEART OF RUSTIC WORCESTERSHIRE

This primitive old place, by the way, is the post-office at Grafton Flyford. Snuff has never lost its devotees here. Note the sign.

Photograph by Emil P. Albrecht

TOO OLD TO GO TO THE FISHING GROUNDS, BUT STURDY STILL AND FULLY COMPETENT TO MOOR NETS TO TRAP SUBMARINES

To the seas which surround them, the British Islands are indebted for the mildness of their climate, their security from invasion, their commerce, and the wealth yielded by productive fisheries.

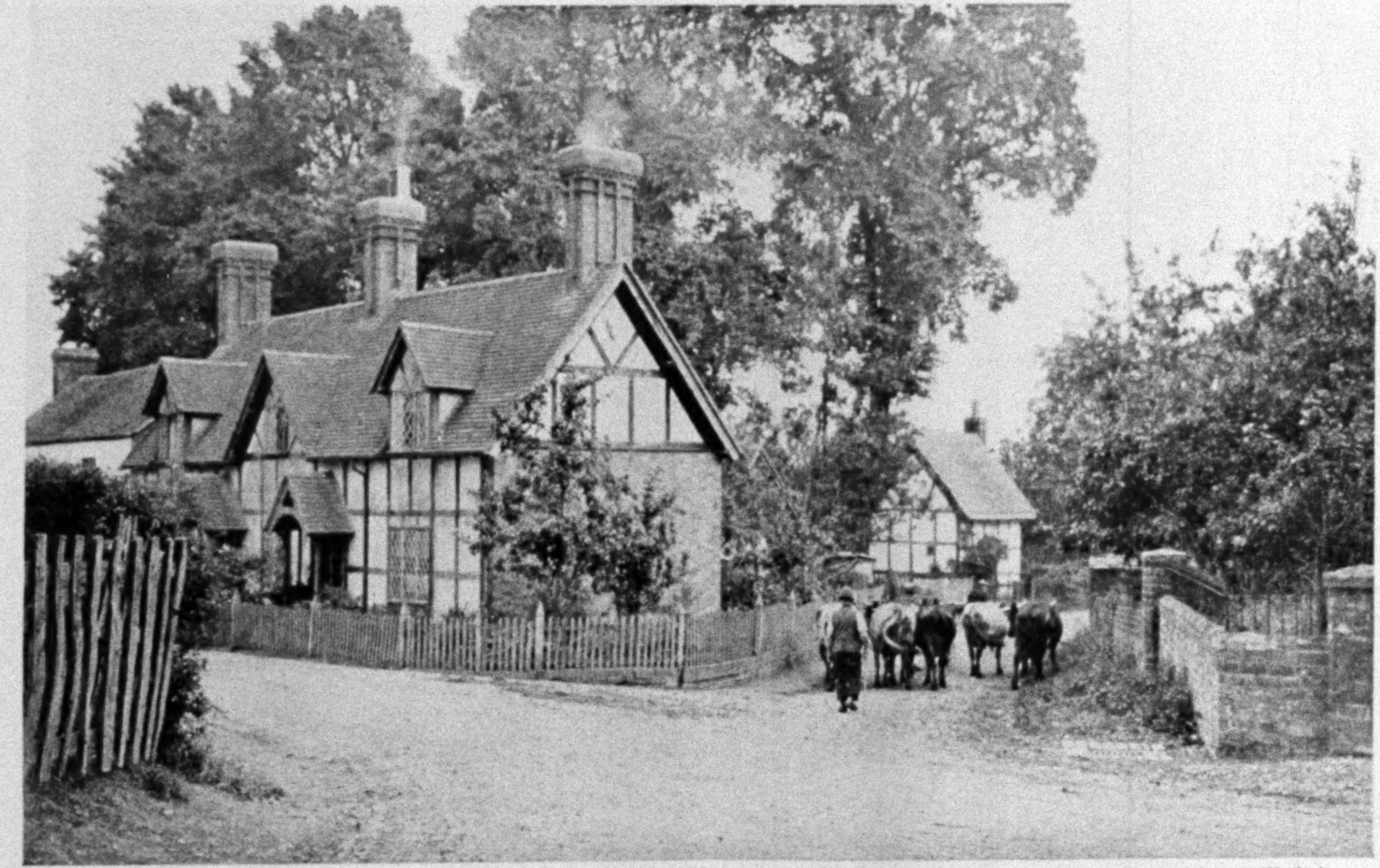
to possess the strongest navy in the world would be to leave her of all nations perhaps the most vulnerable. Probably 90 per cent of all the food her 45,000,000 people consume is brought in by ships engaged in foreign trade.

On the other hand, the splendid coal deposits and the abundant supplies of iron make British industries largely free from blockade dangers. Producing one-fourth of the world's coal, the United Kingdom has little to fear from a coal shortage, no matter what the character of a blockade around her.

The port of London handles approximately one-third of all the exports and imports of the United Kingdom. The ships of the whole world visit it in normal times, and there is scarcely a merchant flag that civilization knows that is missing in the Thames in other than war times.

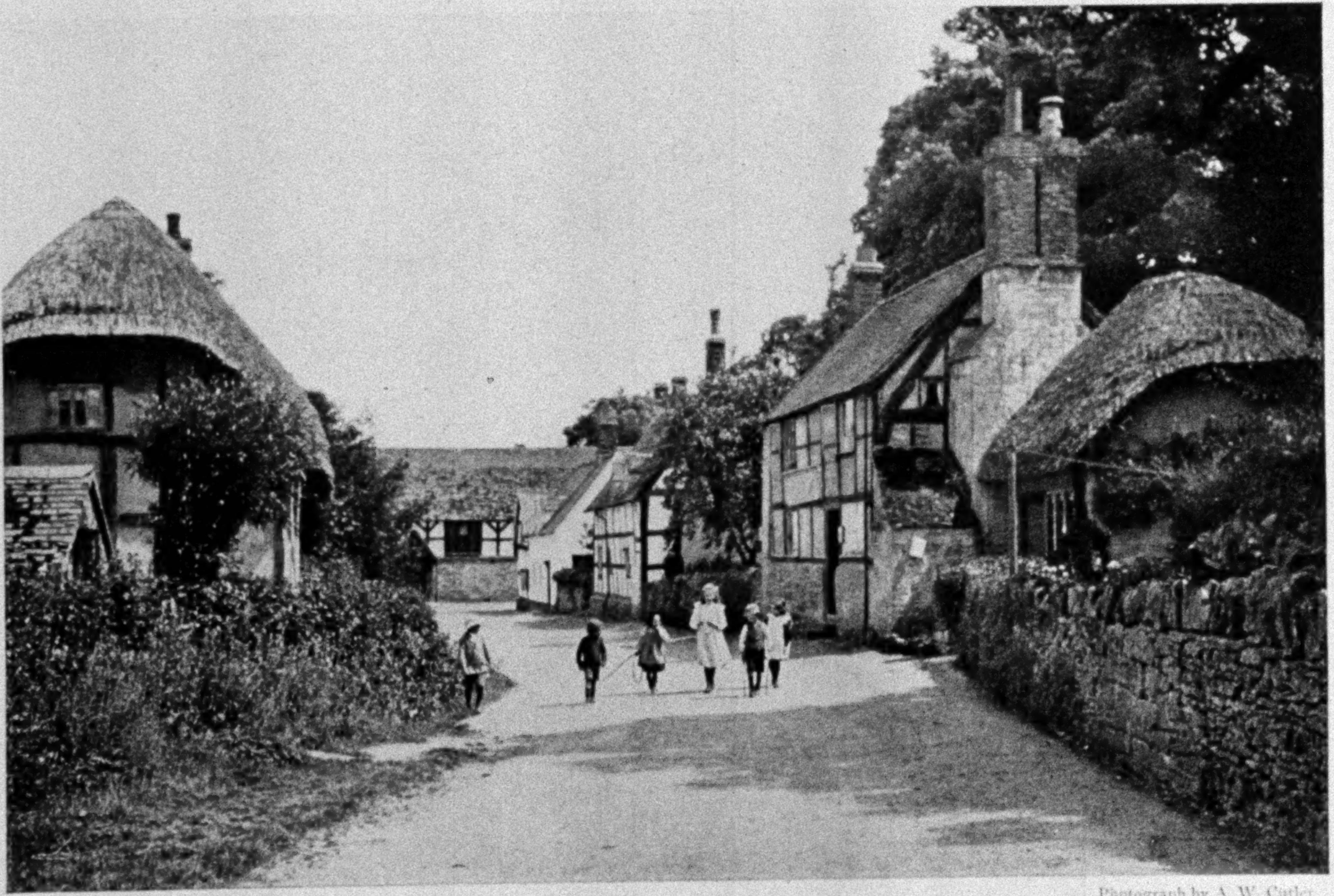
Liverpool has some of the most modern docks in the world. Flanking the Mersey River for a distance of seven miles, the 60 docks, having 26 miles of quay and covering 428 acres of ground, are equipped with every aid known to industry for the rapid handling of the immense quantities of merchandise.

Cardiff is far down the list in the number of ships arriving, but ranks third in



Photograph by A. W. Cutler

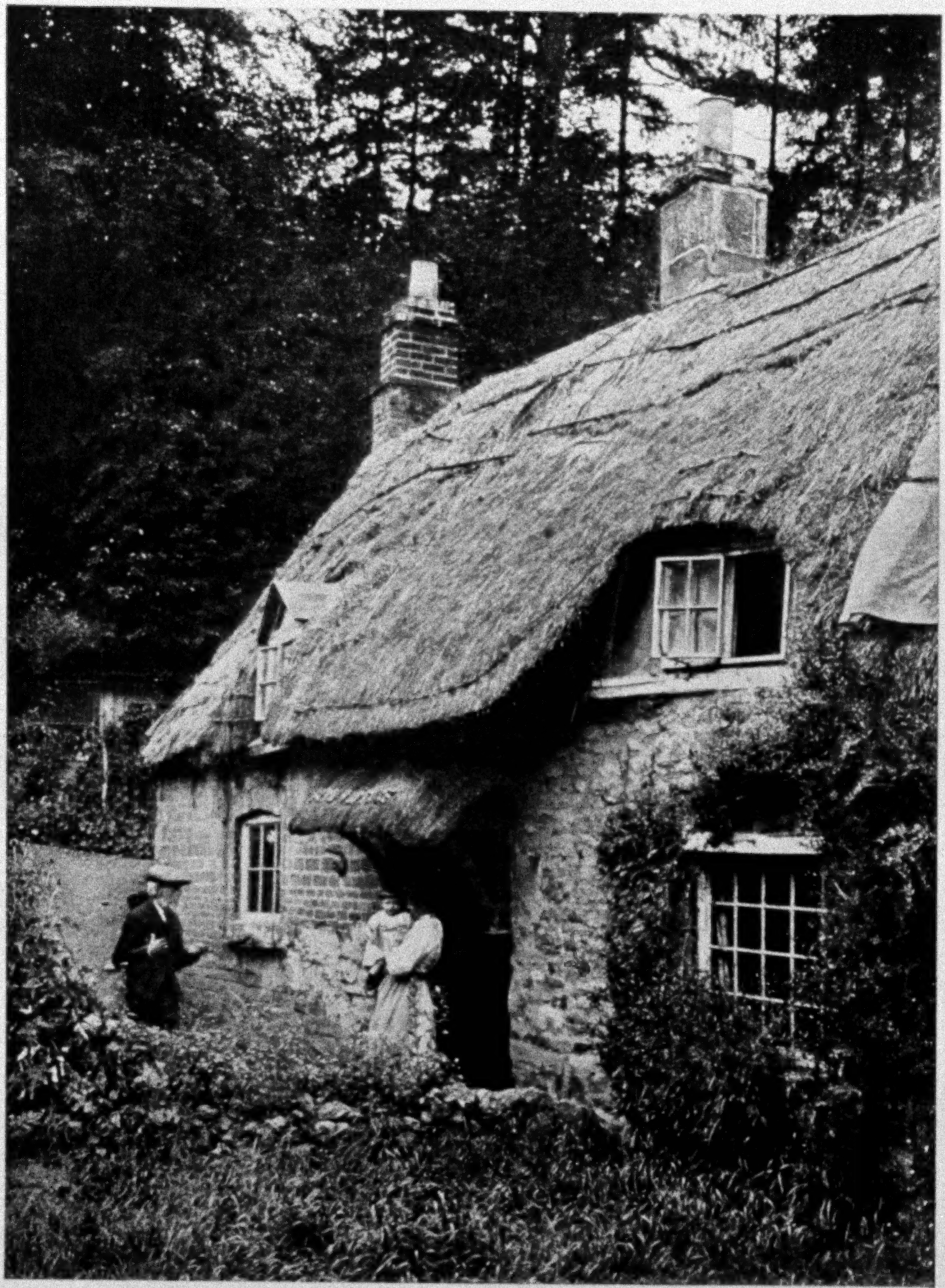
DRIVING HOME THE COWS: A PICTURESQUE SCENE AT THE VILLAGE OF CHURCH LENCH, WORCESTERSHIRE



Photograph by A. W. Cutler

THE CHARMING OLD VILLAGE OF ELMLEY CASTLE, WORCESTERSHIRE

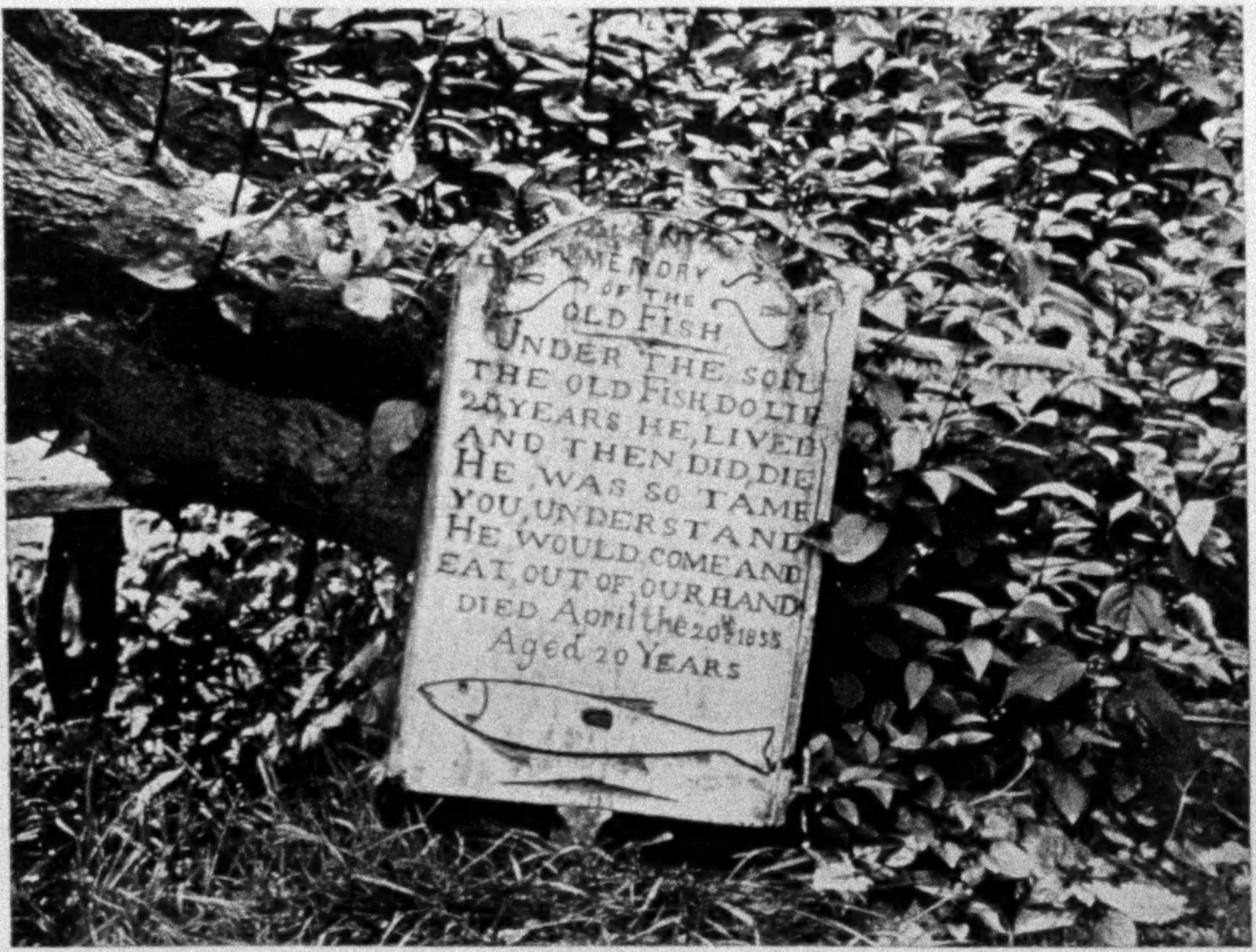
Practically every cottage is half-timbered and thatch-roofed, and most of them have pretty little gardens, entered by wicket gates. The village is very old and remains about as it was in Cromwell's time, when the place was prominent. Some of the houses are built with stone from the old castle, which is now no longer to be seen.



Photograph by A. W. Cutler

"FISH COTTAGES": BLOCKLEY, WORCESTERSHIRE

Here for 70 years Mrs. Keyte lived with her family. Close by is a trout pond. One of the fish became so tame that it would eat worms from its mistress' hand. The cottage is over 300 years old (see next page).



Photograph by A. W. Cutler

AN EXTRAORDINARY TOMBSTONE TO A TROUT

Erected by Mrs. Keyte, of Fish Cottage, Blockley, Worcestershire. The stone recites the story of the trout. Few people would believe this of any fish but a trout.

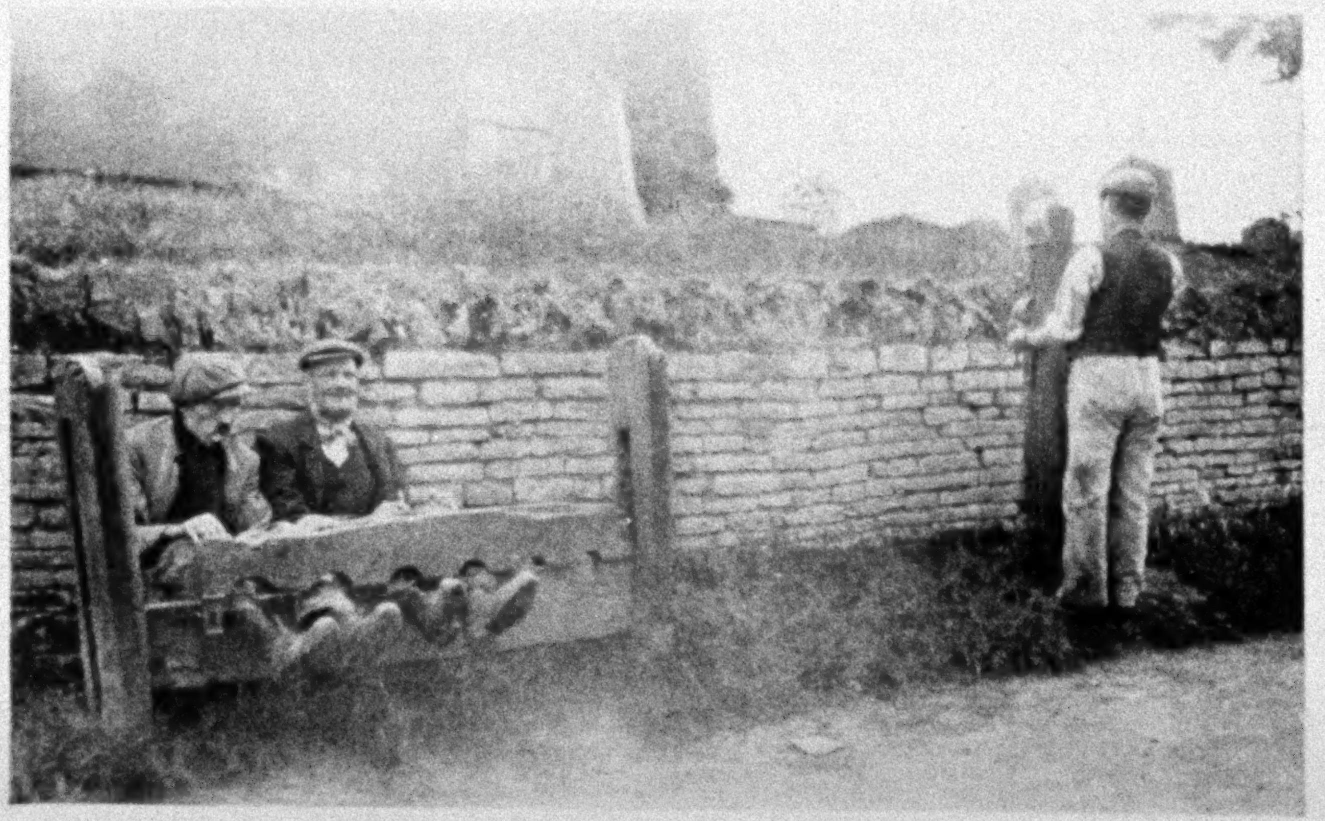
the total tonnage—this being due to the very heavy coal business from that port. Cowes has 24,000 ships a year; Newcastle, 13,000; Portsmouth, 15,000, and Glasgow and Belfast 11,000 each.

With the opening of the Clyde, Glasgow has been brought into direct communication with oversea lands. Dover, with its great Admiralty harbor; Chatham, with its vast Royal Dockyard, where 7,000 workmen are employed even in normal times; Middlesborough, with its great shipbuilding industry; Manchester, with its splendid canal opening up an inland city to world trade; Belfast, with its famous shipbuilders; Portsmouth and Plymouth, on the south coast, with their extensive port works; Grimsby, Hull, and Aberdeen, with the largest fishing fleets in existence; Newlyn and Brixham, homes of the mackerel fisheries, and Milford and Fleetwood, the ports the hake has made famous, are all places full of enterprise, which have been even more active since the war began than they ever were before a "submarine peril" was dreamed of.

As has been said, the British Isles contain no less than 119 ports available for commerce, and practically all of them have been developed for effective use.

Even if the Germans have 500 submarines constructed for the purposes of this blockade, as is claimed, the total makes an average of only about four submarines available for blockading each port.

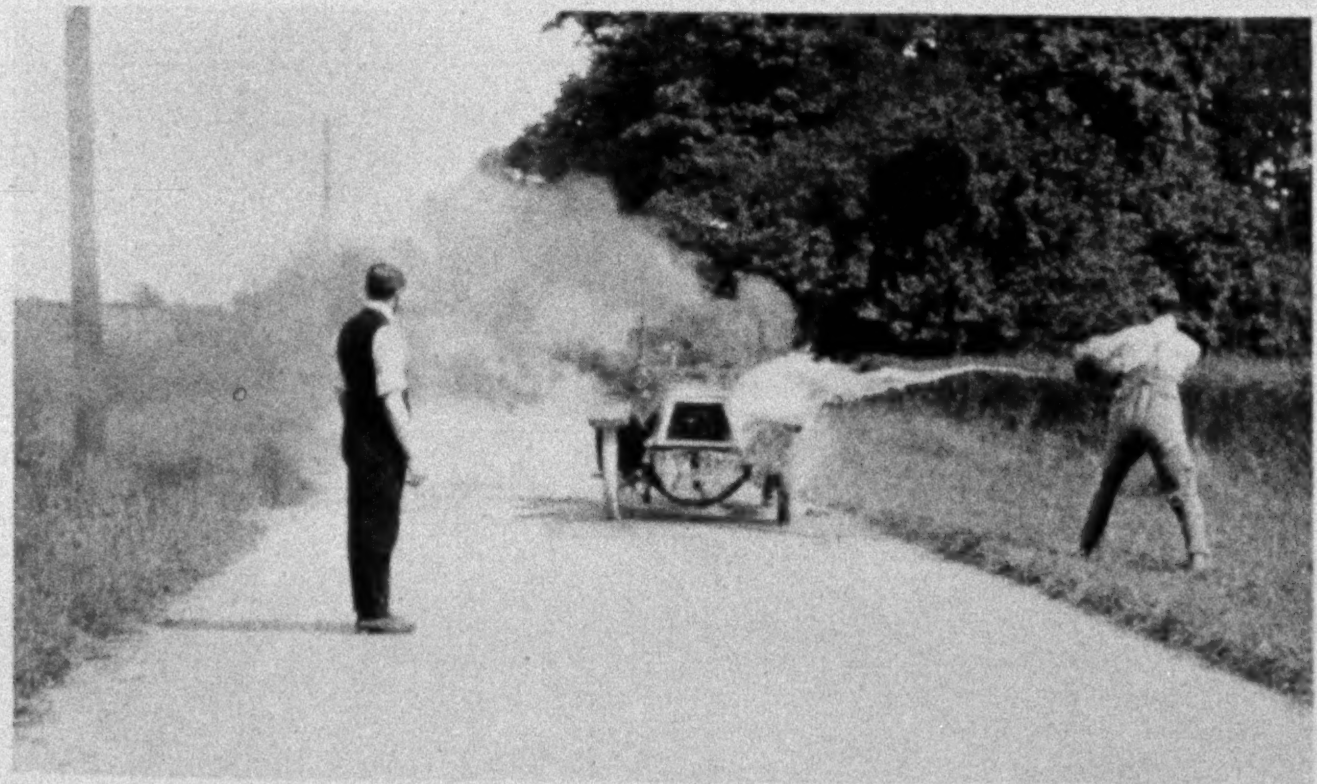
Submarines, with even the largest radius which any of these boats possess, are dependent upon a convenient base or upon the service rendered by a "mother ship." They generally can carry a most limited number of torpedoes, without which they are ineffective, and in addition they are severely handicapped by the very nature of their operations.



Photograph by A. W. Cutler

A REMINDER OF "YE GOODE OLD DAYS": STOCKS AND WHIPPING-POST

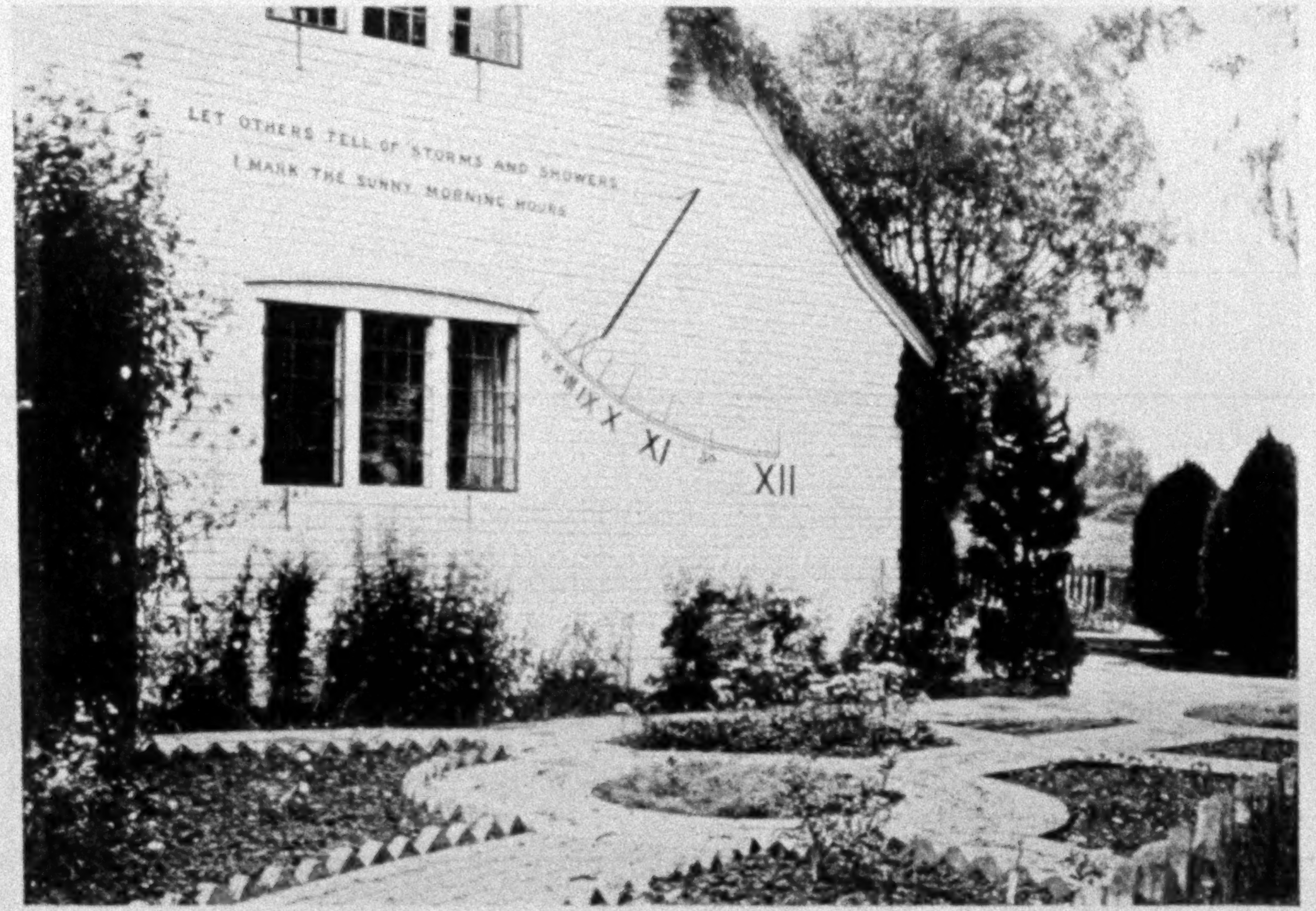
Situated, as was the custom, opposite the church at Rock, Worcestershire. The supremely contented expression on the face of the gentleman on the right may be accounted for by the fact that he knew he would receive one shilling upon being released from the stocks.



Photograph by A. W. Cutler

THIS IS A CURIOUS ACCIDENT THAT OCCURRED RECENTLY ON THE LONDON ROAD

These two young men were bringing this car into Worcester for repairs, when suddenly, without warning, the machine burst into flames. There were three two-gallon tins of gasoline in the automobile, and it did not take those two young men long to get out of the car. Buckets of water thrown on the burning mass proved unavailing. Traffic on either side was tied up for over an hour, expecting every moment that the petrol would explode. Strange to say, it didn't! The car, a Panhard, was totally destroyed—a loss of $1,500.


LET OTHERS TELL OF STORMS AND SHOWERS
I MARK THE SUNNY MORNING HOURS
IX
X
XI
XII

Photograph by A. W. Cutler

THE PICTURESQUE SUN-DIAL HOUSE: HOLMWOOD, SURREY

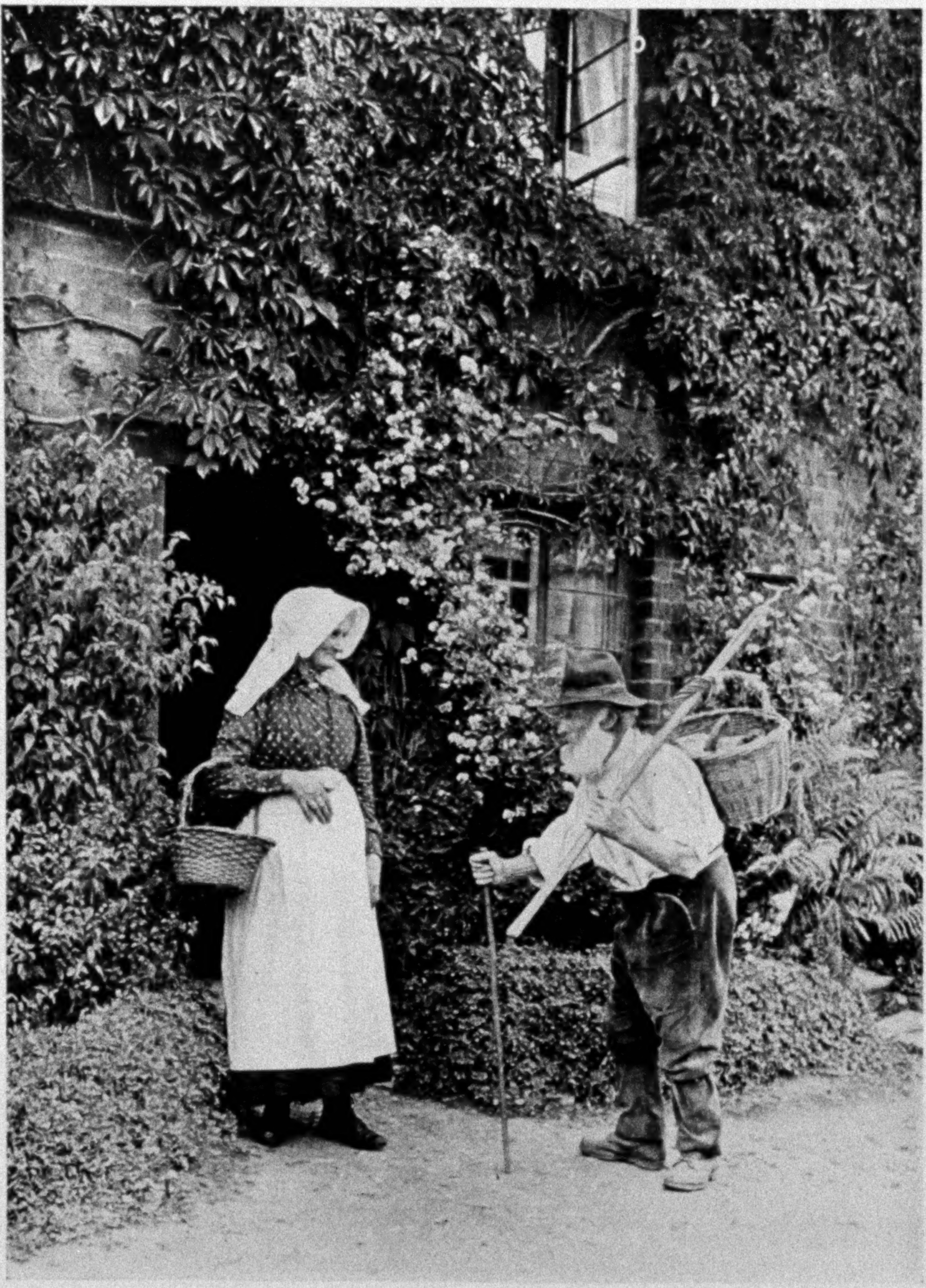
The ordinary blockade is not subject to these limitations. A blockade established upon the surface of the ocean can maintain a constant lookout over a wide expanse of the sea. By use of searchlights, it can be carried on at night as well as by day. Cruisers may be coaled at sea and provided with ammunition openly. The submarine may not. Without a base or a hovering fleet of "mother ships," the submarine cannot do continuous duty on blockade or otherwise.

If it is planned to operate the submarine blockade of the British Isles in relays, the number of ships on duty at a given port will be thereby halved, to the detriment of the blockade's effectiveness. Two submarines to a port could hardly maintain a blockade in the condition which the ordinary interpretation of international law has required to give it recognition among neutrals.

British domination of the sea has not come about by chance. England's geographic limitations have compelled her to keep the avenues of ocean traffic open through constant readiness to render naval protection to her carrying trade; and it is the result of her insular position that her activities have developed on sea and land.

What Nature has always done for the children of the wild by rendering them adaptable, through habit and through equipment, to the environment in which they are placed, the English people have done for themselves. Cribbed, cabined, and confined upon a group of islands limited in area and capable of inadequate productiveness, even with the most intensive of cultivation, they were forced, first, to command the avenues of supply for themselves and, in order to meet the increasing expense of such necessity, second, to develop their manufacturing resources to the highest degree.

To this they owe the great number of ports which they now possess and which, by their very numbers, render a blockade, however attempted, a herculean task. A clearer example of how nations are limited or advanced by their geographic environment could hardly be found.



Photograph by A. W. Cutler

"WELCOME HOME, GRAND-DAD": A GLIMPSE OF RURAL LIFE AT ELMLEY CASTLE, WORCESTERSHIRE

With sons at the front the path to the village post-office is a beaten track for this aged couple and thousands like them. And, alas, only too often does the weary trip bring the news from "Somewhere in France" that death has been the soldier's crown!

Victor

"HIS MASTER'S VOICE"

REG. U.S. PAT. OFF.

The Victor Record catalog is the most complete catalog of music in all the world

It has required 19 years of constant research, of steady application, of tireless effort, and the expenditure of more than Eleven Million Dollars to place this catalog in your hands

This great book of 506 pages is the recognized authoritative index to the world's best music; to the greatest musical achievements of all time.

Its pages are living tributes to the years of unceasing vigil spent in gathering the best music from every portion of the globe. They reflect the hours upon hours which the greatest artists have devoted to recording their superb art for the delight of all generations. They attest to the enormous amount of time and millions of dollars spent in developing the art of recording to its present state of perfection. And through each and every page runs the story and proof of Victor Supremacy.

Every music-lover will want a copy of this great Victor catalog of music

Everybody should have this book, whether or not they have a Victrola. All will appreciate it because of the information about artists, operas and composers, and the numerous portraits and illustrations it contains.

Any Victor dealer will gladly give you a copy of this great catalog of music, or we will mail you a copy free, postage paid.

Victor Talking Machine Co.
Camden, N. J., U. S. A.
Berliner Gramophone Co., Montreal, Canadian Distributors

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RECORDS
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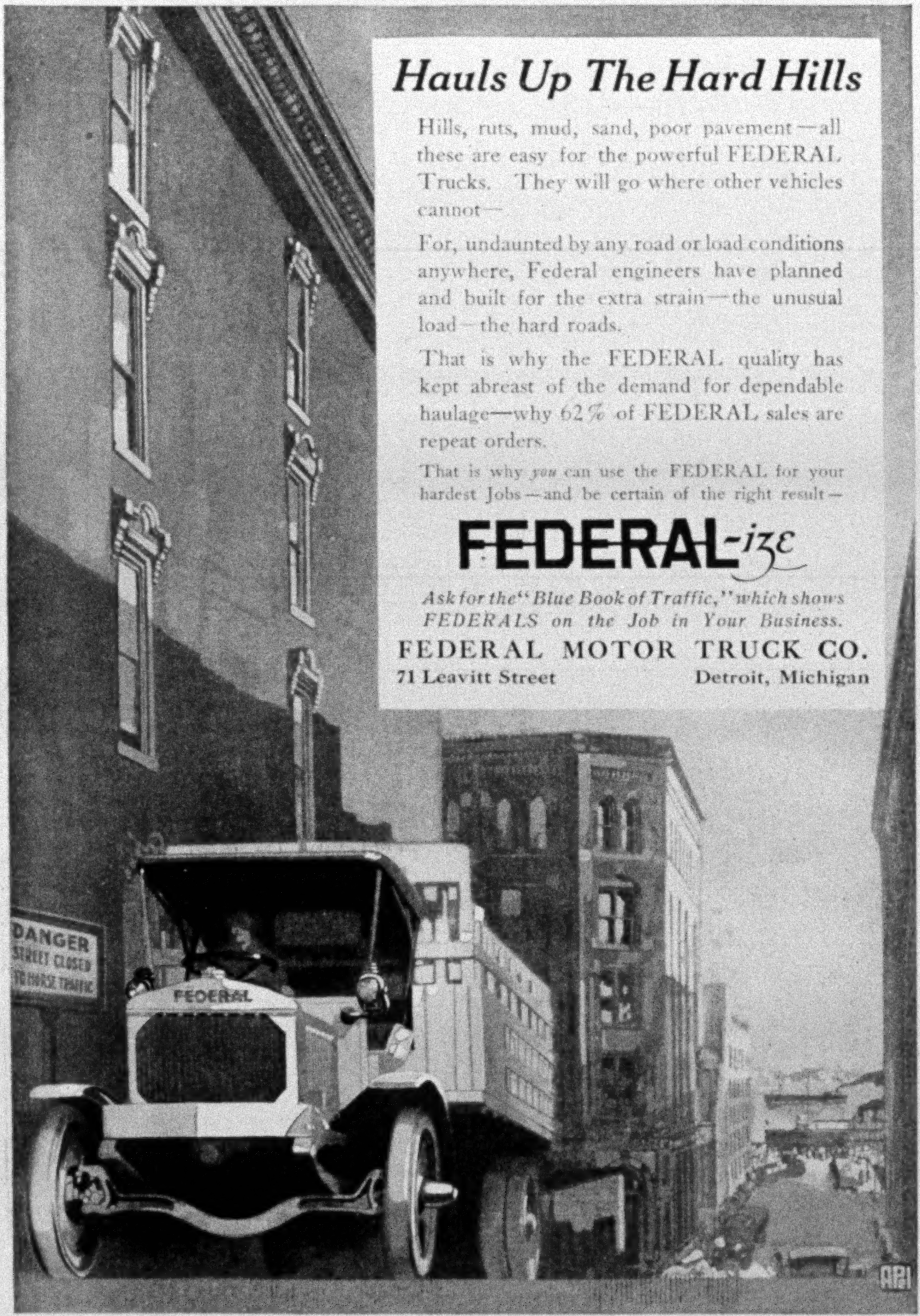

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Hills, ruts, mud, sand, poor pavement—all these are easy for the powerful FEDERAL Trucks. They will go where other vehicles cannot—

For, undaunted by any road or load conditions anywhere, Federal engineers have planned and built for the extra strain—the unusual load—the hard roads.

That is why the FEDERAL quality has kept abreast of the demand for dependable haulage—why 62% of FEDERAL sales are repeat orders.

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Ask for the "Blue Book of Traffic," which shows FEDERALS on the Job in Your Business.

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Wayne Street Hill, Detroit—from an actual photograph

The administrative center of the American Republic—the National Capitol, Washington, D. C.

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Two cardinal properties—pliancy and strength—determine the efficiency or incompetence of any automobile tire.

On pliancy depends comfort, activity, power-saving and fuel-thrift.

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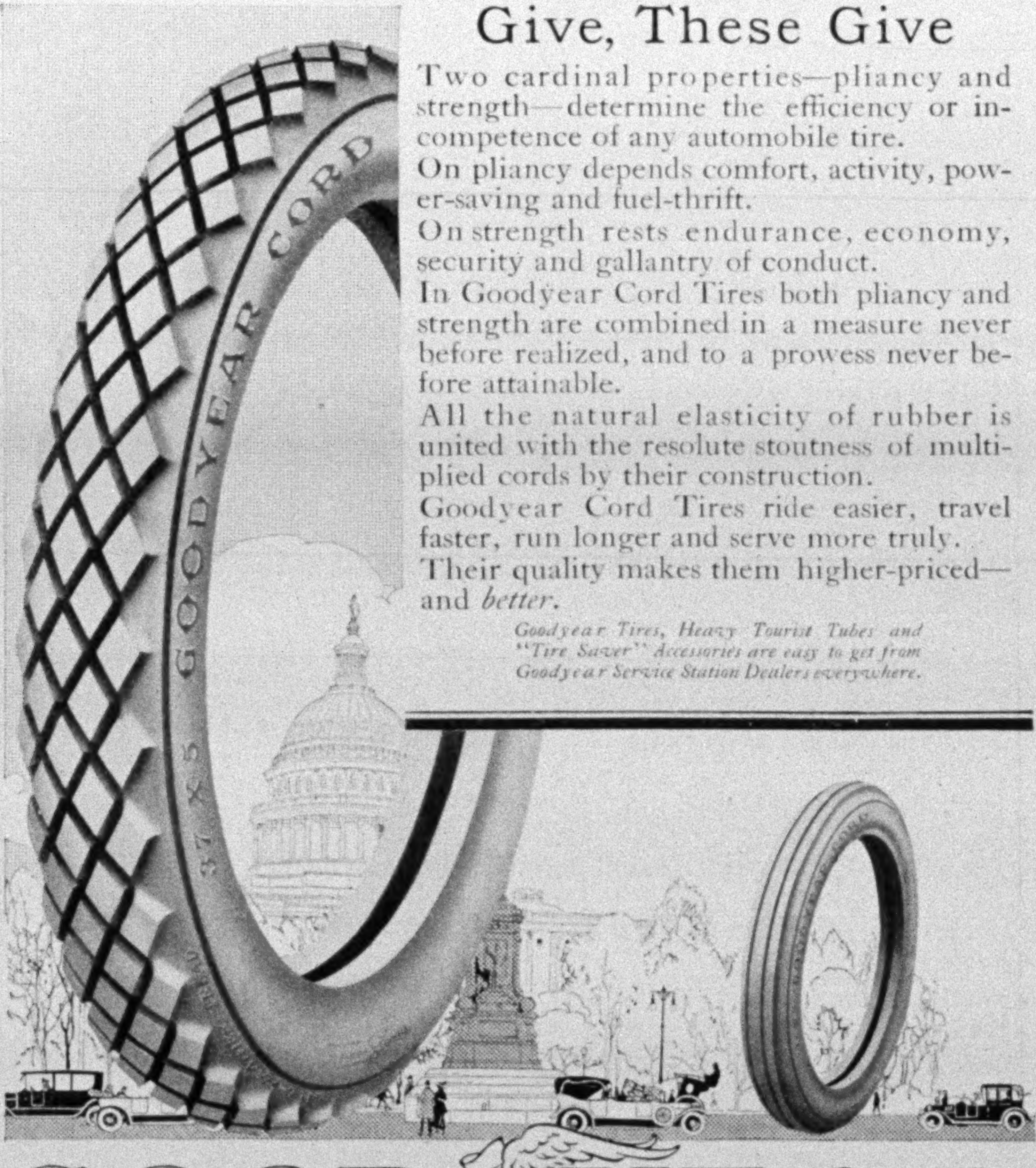
In Goodyear Cord Tires both pliancy and strength are combined in a measure never before realized, and to a prowess never before attainable.

All the natural elasticity of rubber is united with the resolute stoutness of multiplied cords by their construction.

Goodyear Cord Tires ride easier, travel faster, run longer and serve more truly.

Their quality makes them higher-priced—and *better*.

Goodyear Tires, Heavy Tourist Tubes and "Tire Saver" Accessories are easy to get from Goodyear Service Station Dealers everywhere.



GOODYEAR
AKRON
CORD TIRES

"KODAK"

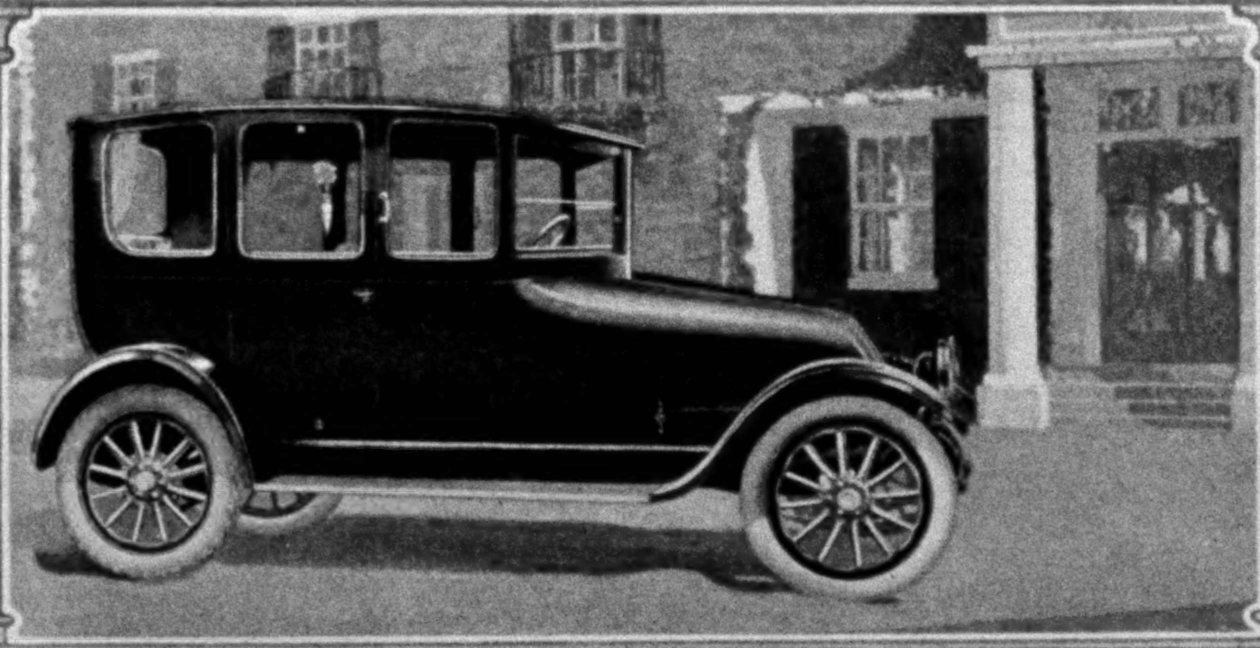
Is our Registered and common-law Trade-Mark and cannot be rightfully applied except to goods of our manufacture.

If a dealer tries to sell you, under the Kodak name, a camera or films, or other goods not of our manufacture, you can be sure that he has an inferior article that he is trying to market on the Kodak reputation.

If it isn't an Eastman, it isn't a Kodak.

EASTMAN KODAK COMPANY,
ROCHESTER, N. Y., *The Kodak City.*

THE FRANKLIN CAR



FIND a man who has experienced the luxury of a Franklin Enclosed Car for *summer use*.

Ask him what he thinks of the Enclosed Car idea for summer.

He will tell you that he has made a *discovery* in motoring: that he will never use any other type of car: that all the objections you can think of are not true or do not apply to the Franklin.

He will tell you that the lightness and resilience of the Franklin make it practical for *any kind of driving*, on any sort of road, any time, anywhere.

That he gets all the *free-blowing air* there is—as much or as little as he wants.

That he can *regulate* the amount of ventilation. That he can instantly adjust the windows for any sort of weather—shut out dust or rain; drive for fifty miles on a hot summer afternoon and step out of the car *clean* and *cool*.

Then he will tell you what it means to his wife and family. The comfort of wearing what they please *en tour*; the freedom from grimy, parched skins and enveloping veils; the joy of stepping onto a hotel veranda without looking like the rescued survivors of a wrecked Cook's Tour.

Then he will come back to the specific features of Franklin construction—its *flexibility*, the *lightness* of its unsprung weight. He will tell you of *easy riding* over rough roads, its *liveliness* on the hills, its *maximum speed* from place to place, its economy in gasoline, its remarkable tire mileage.

Features that apply *equally* to Enclosed or Open models—the features that make the Franklin so definitely an *all-around efficient car*.

Touring Car	2280 lbs.	—$1950.00	*Cabriolet*	2485 lbs.	—$2750.00	*Town Car*	2610 lbs.	—$3100.00
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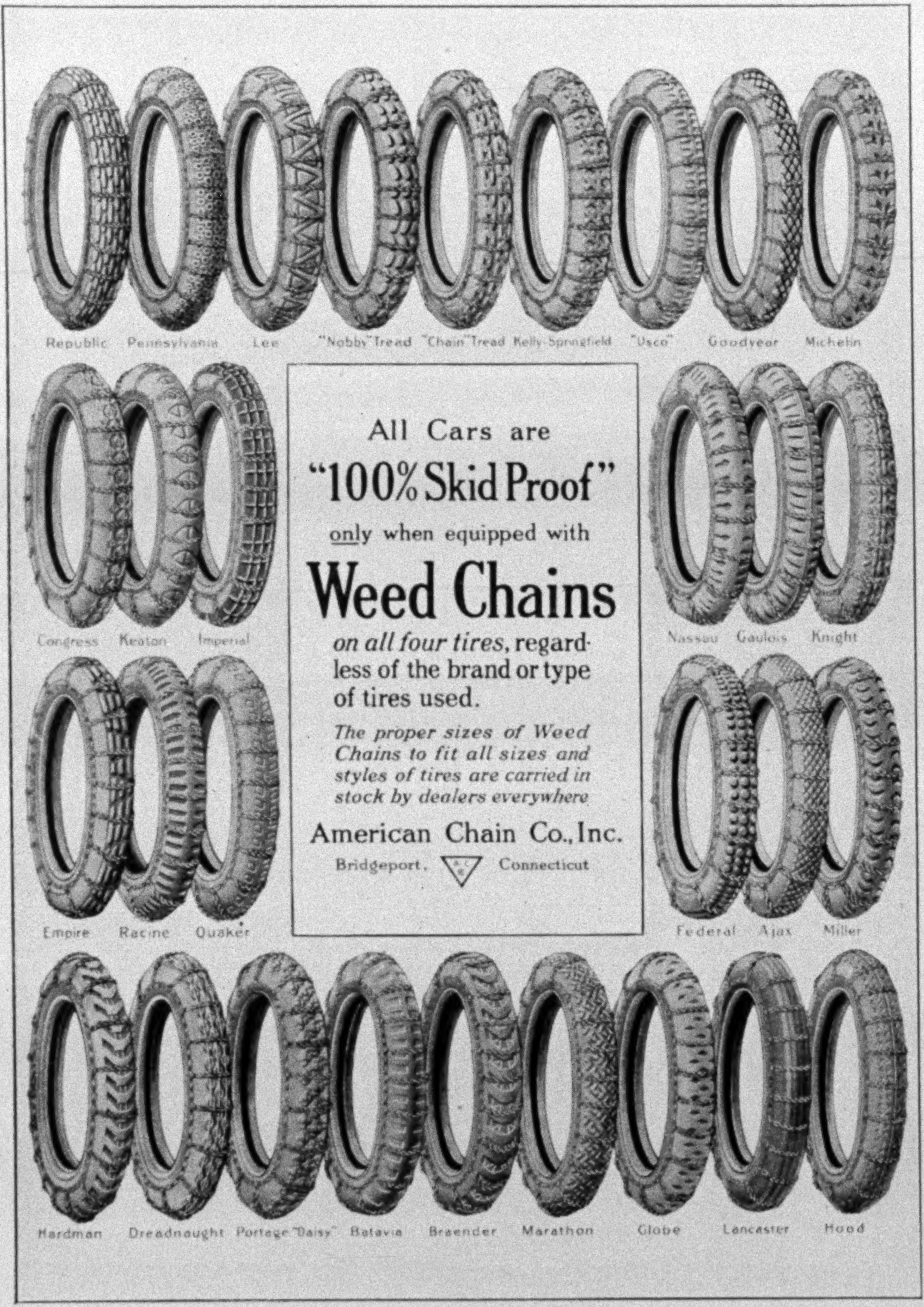
Four-passenger Roadster	2280 lbs.	— 1950.00	*Brougham*	2575 lbs.	— 2800.00	*All Prices F. O. B. Syracuse*		

FRANKLIN AUTOMOBILE COMPANY

SYRACUSE, N. Y., U. S. A.


Republic
Pennsylvania
Lee
"Nobby" Tread
"Chain" Tread
Kelly-Springfield
"Usco"
Goodyear
Michelin
Congress
Keaton
Imperial
Nassau
Gaulois
Knight
Empire
Racine
Quaker
Federal
Ajax
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All Cars are

"100% Skid Proof"

only when equipped with

Weed Chains

on all four tires, regardless of the brand or type of tires used.

The proper sizes of Weed Chains to fit all sizes and styles of tires are carried in stock by dealers everywhere

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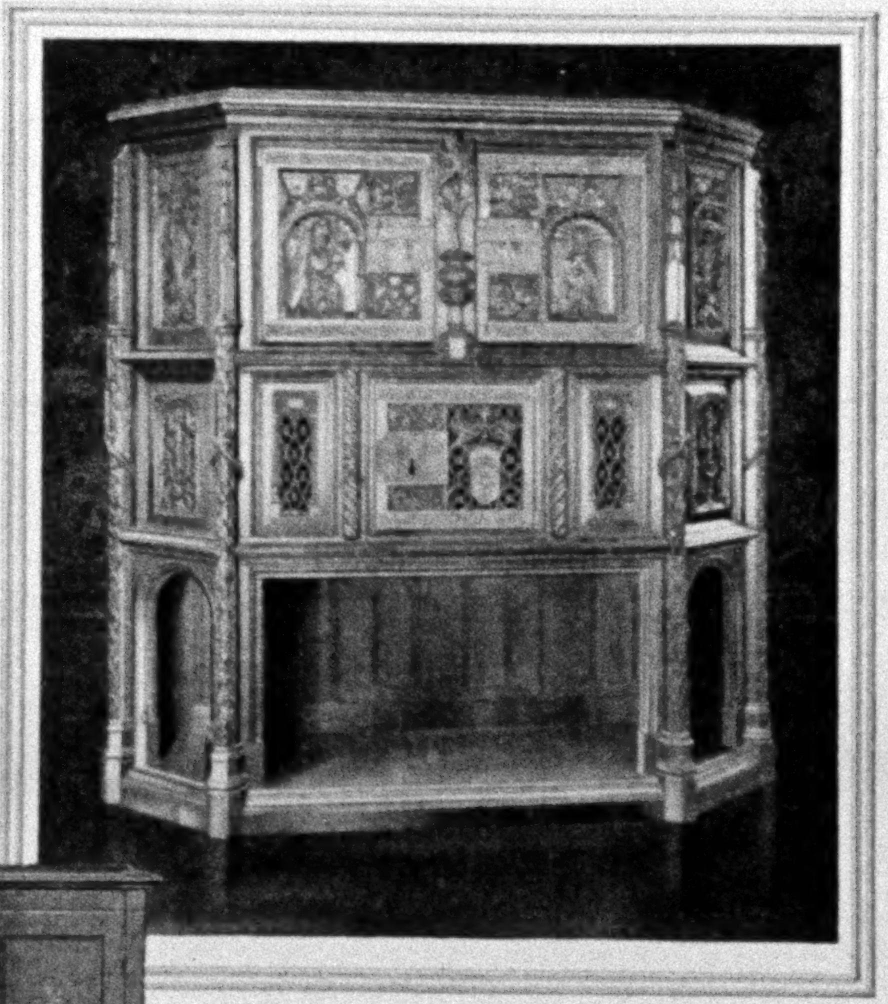
Bridgeport, Connecticut

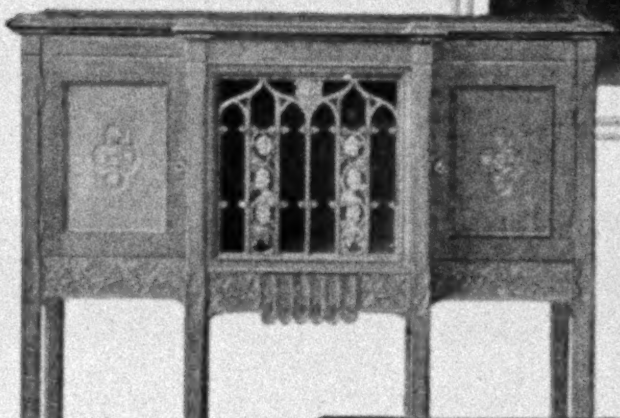
"Our net saving—by mimeographing this lot of requisitions—is eleven dollars. We paid a printer seventeen dollars for our last supply." Here's *economy* with independence in duplicating forms, letters and circulars for store, factory and office. You simply typewrite, hand-write, rule or draw whatever you want copied; put the stencil on the mimeograph—which is automatically fed, automatically inked, electrically operated—and *in twenty minutes* have a thousand perfect duplicates. Easy! There's no type to set—and throw in; no cuts to buy—and throw away; no printers to wait on—and pay. Booklet "D" explains how the mimeograph will help you improve your systems and your business—and save money. A. B. Dick Company, Chicago—and New York.

MIMEOGRAPH
EDISON-DICK

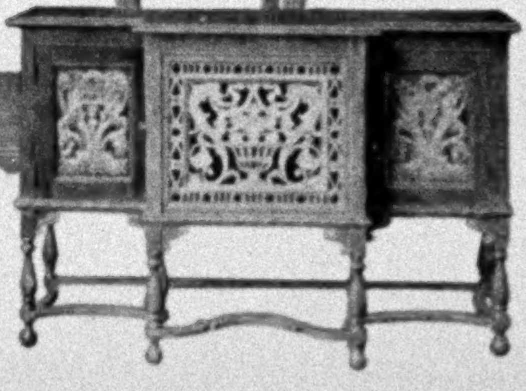
THESE NEW EDISON instruments are equipped with electric motors, electric automatic stops and complete electric lighting systems, thus combining the historic design of the cabinets themselves with the most modern and convenient equipment.



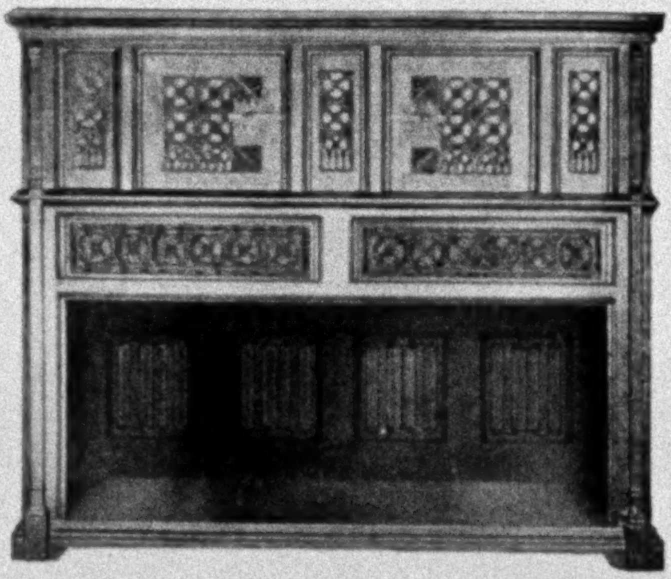
FRENCH GOTHIC
(OAK) 7 feet long and 7 feet 1 inch high
Reproduced from a celebrated cabinet of the reign of Louis XII, now the property of the French Government



FRENCH GOTHIC
(OAK)
4 feet 6 inches long and 4 feet high
XV Century, with skilful restraint of flamboyant Gothic conception



ITALIAN
(WALNUT)
4 feet 10 inches long and 3 feet 2 inches high
Expresses authentically the adornment characteristic of Italian Renaissance



FRENCH GOTHIC
(OAK) 7 feet 6 inches long and 6 feet 3 inches high
Very early XVI Century, illustrating the parchment panel in its best form

HISTORIC CABINETS $6,000 ~ and down

MUSIC'S RE-CREATION IN HAND MADE CABINETS REPRODUCED FROM OLD WORLD MASTERPIECES FOR

The NEW EDISON

"the phonograph with a soul"

THOMAS A. EDISON'S genius and $3,000,000 of his money, courageously spent in research work, have recently given to the world an instrument which literally Re-creates all forms of music. To prove that this is true, Marie Rappold, Anna Case, Arthur Middleton and eighteen other great artists have stood beside this new invention and sung in direct comparison with its Re-Creation of their voices. Three hundred thousand music lovers have heard these astonishing tests and they, as well as the music critics of nearly three hundred of America's principal newspapers, concede without reservation or qualification that the New Edison's Re-Creation of an artist's voice cannot be detected from the original. Instrumentalists have made similar tests with similar results. Edison has accomplished the miracle of Music's Re-Creation.

It is not surprising that there should be a demand for cabinets as much superior, in a furniture sense, to familiar kinds of talking machine cabinets as the New Edison is superior, in a musical sense, to all other devices for the reproduction of musical sounds. A competition was held among designers and two master craftsmen were selected, who have produced what are not alone the finest phonograph cabinets in the world, but also deserve to take place with the finest furniture of any description to be found in America. The illustrations on these pages give but a faint idea of these wonderful cases. Licensed dealers will show you large prints in colors.

In addition to the historic hand made cabinets pictured on these pages the New Edison is supplied in other period models at $100 to $375. There is no Edison cabinet which will not appeal to sophisticated taste, and there is an artistic type for every setting. You will oblige us if you will write for a booklet depicting the less expensive models in colors.

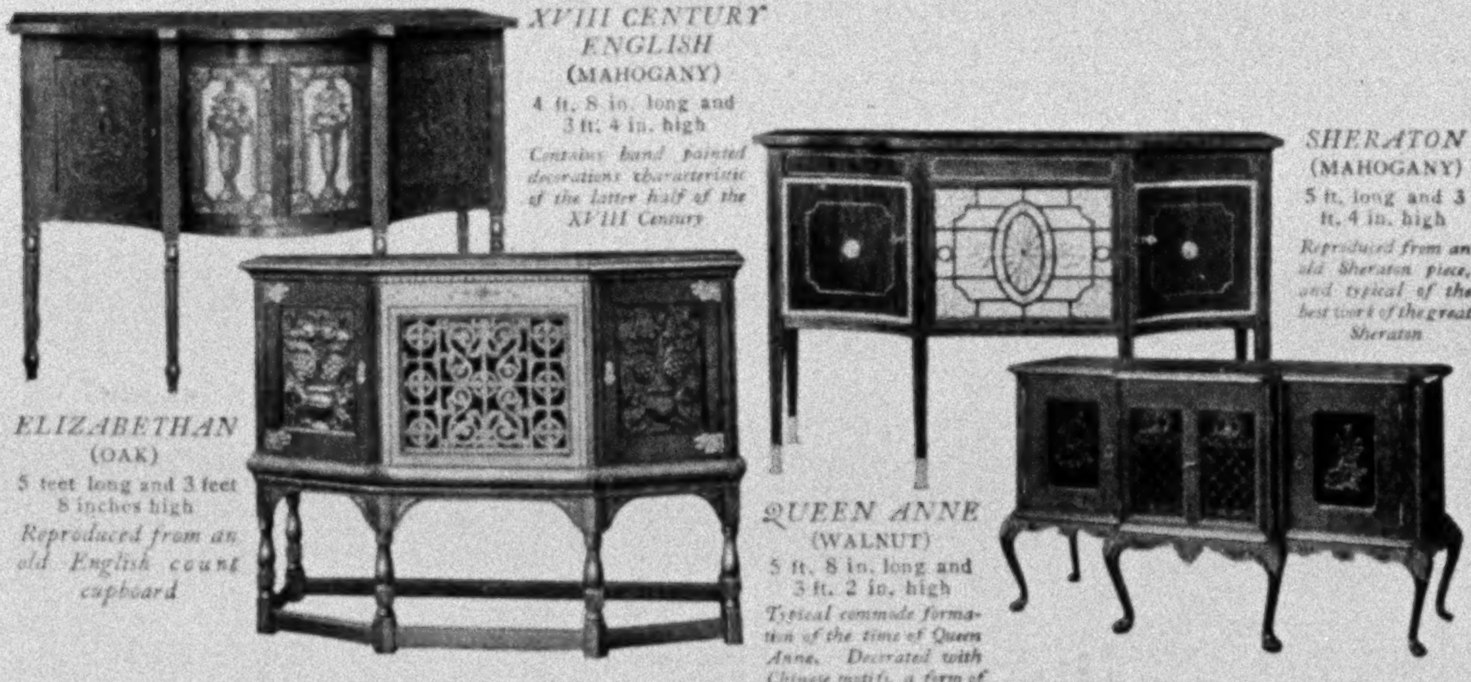
MR. EDISON REQUIRES THAT WE MAKE THE FOLLOWING ANNOUNCEMENT:

"Those who are concerned solely in obtaining the best musical result need not pay more than $250, as the Official Laboratory Model, which sells at $250, is equal in a musical sense to the most expensive models. It is in fact the model we have used in the public comparisons at Carnegie Hall and elsewhere between the living voice and our Re-Creation of it."

IF INTERESTED IN THE TESTS TO WHICH MR. EDISON REFERS, PLEASE WRITE US FOR THE BOOKLET "WHAT THE CRITICS SAY"

Please do not ask an Edison dealer to sell you Edison Re-Creations if you intend to attempt to play them on any other instrument than the New Edison. No other instrument can bring out the true musical quality of Edison Re-Creations. Furthermore, injury to the records is likely to result if you attempt to play them on an ordinary phonograph or talking machine.

THOMAS A. EDISON, INC., DEPT. 1501, ORANGE, N. J.

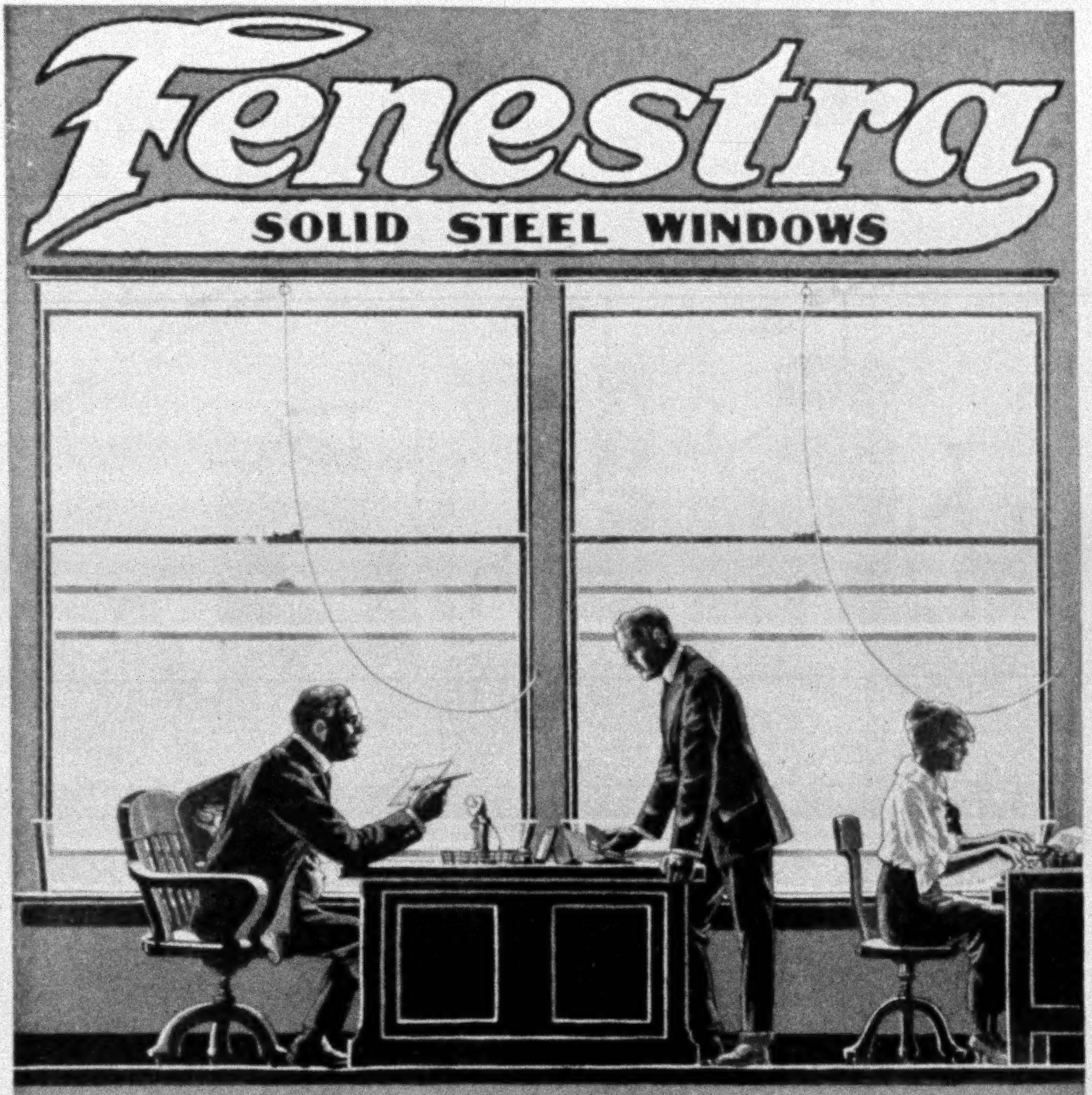


XVIII CENTURY ENGLISH
(MAHOGANY)
4 ft. 8 in. long and
3 ft. 4 in. high
Contains hand painted decorations characteristic of the latter half of the XVIII Century

ELIZABETHAN
(OAK)
5 feet long and 3 feet
8 inches high
Reproduced from an old English count cupboard

SHERATON
(MAHOGANY)
5 ft. long and 3
ft. 4 in. high
Reproduced from an old Sheraton piece, and typical of the best work of the great Sheraton

QUEEN ANNE
(WALNUT)
5 ft. 8 in. long and
3 ft. 2 in. high
Typical commode formation of the time of Queen Anne. Decorated with Chinese motifs, a form of embellishment much in favor at that time



INSIDE—your office—warm, light, comfortable—work progressing with its usual speed and smoothness.

Outside—the city—cold, dark and blizzard-swept; traffic snowbound; thoroughfares almost impassable.

A weather-resisting wall of Fenestra Solid Steel Windows with vertically sliding sash is the key to this sharp contrast of conditions.

Vertically sliding Fenestra is as serviceable for your office building as pivoted steel sash is for your factory. Made where most of America's steel windows are made—at the Detroit Steel Products Company, 2250 East Grand Boulevard, Detroit, Michigan.

You must act quickly to get a set of the New

Encyclopaedia Britannica

Handy Volume Issue

No more India paper!

Act now if you want the Britannica printed on genuine India paper!

Over 160,000 sets already sold! Only a few thousand sets remain unsold!

No more can be offered on India paper when these are sold!

India paper makes this great work five times more valuable to you.

(See Inside Pages)

Act Now A rare chance World's Great

WARNING!

Sets of the new Britannica printed on the last genuine India paper obtainable are selling fast. No promise can be given as to how long the remaining sets will last.

Therefore *we urge you to act immediately* as the only way of getting the new Britannica in the popular "Handy Volume" form, printed on genuine India paper. You certainly want it in this, its most useful form.

India paper is the most wonderful, most useful paper made. It is *light-weight, thin* and *strong.* Its use for the new Britannica was a near-miracle in book publishing. It made it possible to put this great Library of *all* Knowledge in convenient form—29 compact volumes, requiring only 29 inches of shelf space.

And *remember—when the sets now on hand are sold,* no more can be offered printed on this famous paper. Because—war has entirely cut off the supply of the special kind of flax necessary to manufacture this beautiful paper. This flax is grown only in Great Britain, Belgium and Germany—*and no more can be had.*

That's the whole story. This difficulty was not foreseen. When the Britannica was put into "Handy Volume" form, the publishers thought they would be able to get all the India paper needed to print as many sets of the Britannica as could be sold. The fact is that the remaining sets, printed on the last obtainable India paper, will meet only a fraction of the demand.

You can't afford to wait until "tomorrow" to own a set—the time to act is now—today.

The Encyclopaedia Royal Road

HOW much do you *know?* How much do you earn? Are you **above** or *below* the line of "average-intelligence, average-income?"

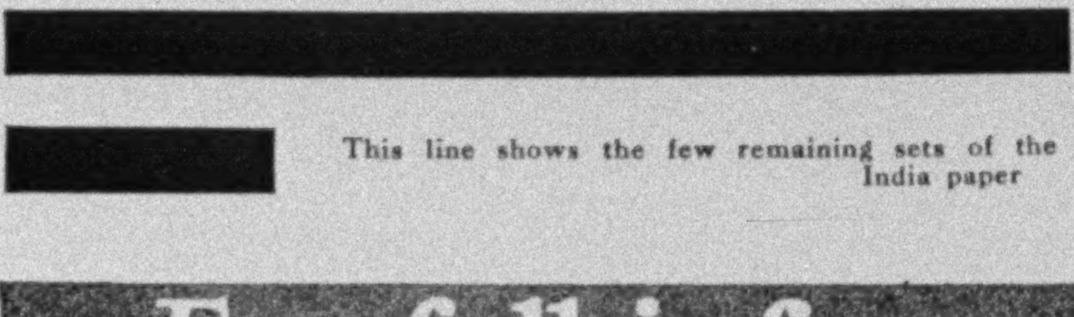
If you are keeping step with Twentieth-century progress, you realize that you must know *more and more* every day. And what you know must be *facts.* Generalities don't help you out.

It is obvious that you can't accumulate all the knowledge you need by traveling and talking to others—nor can you carry in your head all you want to know outside your own personal experiences. Therefore, the new Britannica is *indispensable* to you—

> **BECAUSE—it deals with life and civilization and progress in the broadest sense. Its scope is universal—comprising the sum and substance of human thought and activity. It covers everything under the sun—and the sun itself.**

This great *library of knowledge*—consisting of 30,000 pages teeming with facts and information—is the work of 1500 master minds, the world's foremost experts in every line. Its contents are too comprehensive to be adequately described here. Sufficient it is to say that the Britannica discusses in a way you can understand every branch of science and industry, literature and art, religion and philosophy, invention, engineering, history, biography, geography, geology, architecture, astronomy, law, botany, education, electricity—EVERYTHING.

The new Britannica is a book for men and women in all walks of life—for the millionaire as well as for the wage-earner, for the expert as well as the student, for the clerk as well as for the merchant, for the bank



This line shows sets of the Britannica already sold

This line shows the few remaining sets of the Britannica printed on genuine India paper

For full information mail

e to own the test Library

Act Now

Britannica Is the to Success

president as well as for the bank clerk—for the *home* as well as the *office*.

You probably have some idea of how *useful* the Britannica would be to you—just as its daily practical value is proved in the case of its 160,000 present owners.

Andrew Carnegie has said: *"A half-hour a day spent on a particular line of study is the best investment any man can make."*

Whatever your *"particular line"* is, the Britannica will equip you to become proficient in the highest degree. Whether you are interested in the stars above or in coal mining, in electricity or chicken raising, in house building or carpet manufacture, the Britannica is an invaluable aid. You need it—you should have it.

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Realize that this small sum daily will, in a very short time, give you the outright *ownership* of the world's greatest book of knowledge—the new Britannica, in the popular "Handy Volume" form.

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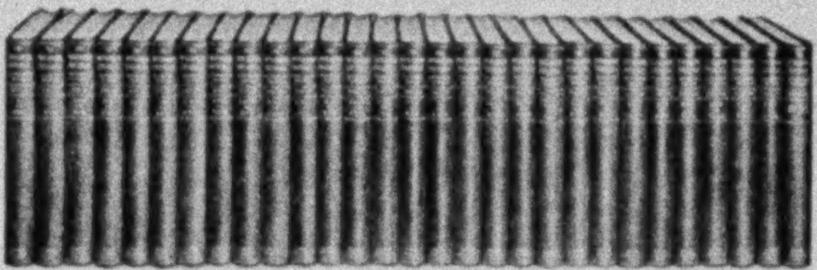
RICHARD C. MACLAURIN
President, Massachusetts Institute of Technology.

Here is the sum and substance of all human knowledge—

41,000 articles, 30,000 pages, 15,000 illustrations, 500,000 indexed facts



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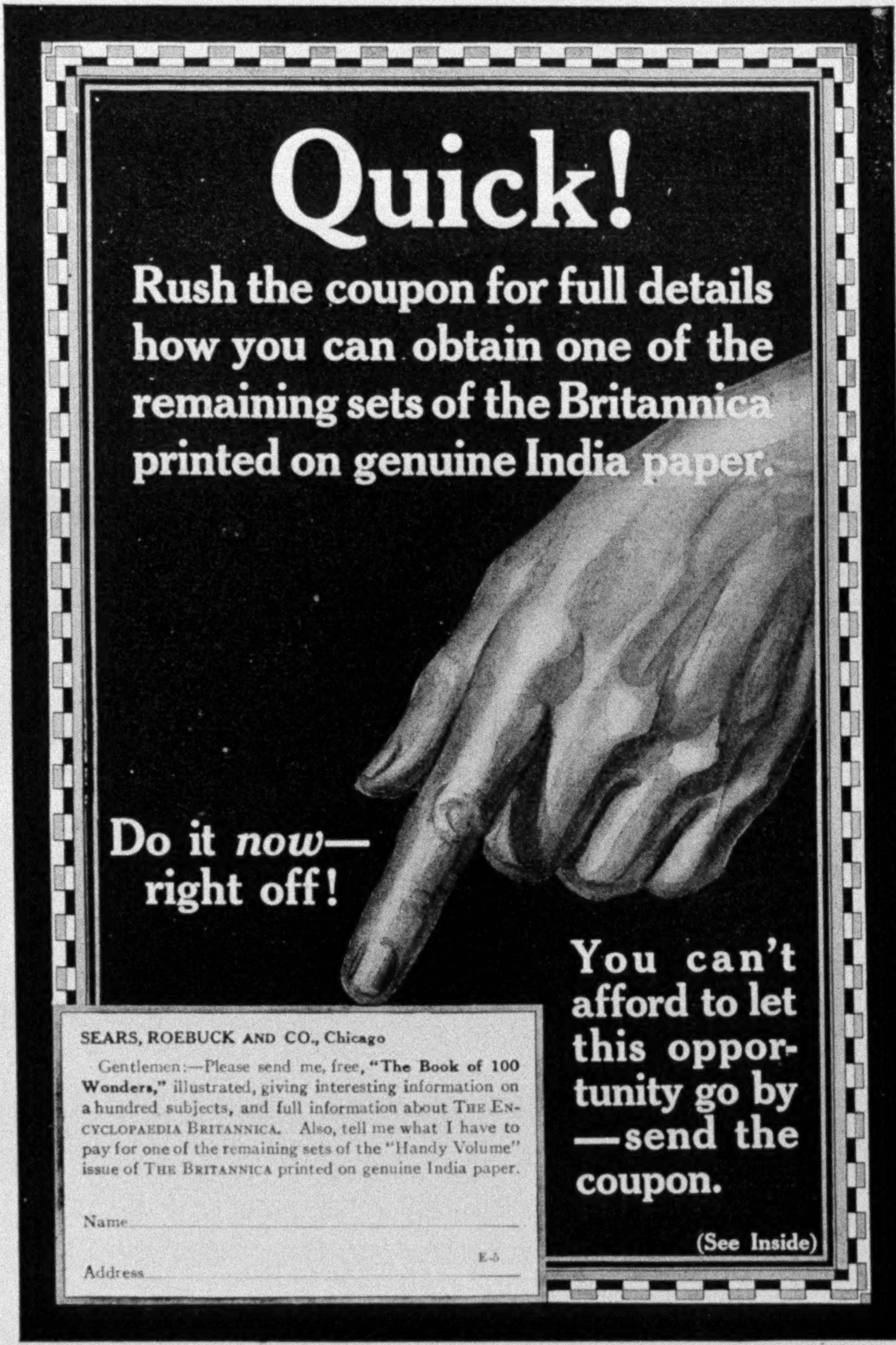

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Rush the coupon for full details how you can obtain one of the remaining sets of the Britannica printed on genuine India paper.

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(See Inside)

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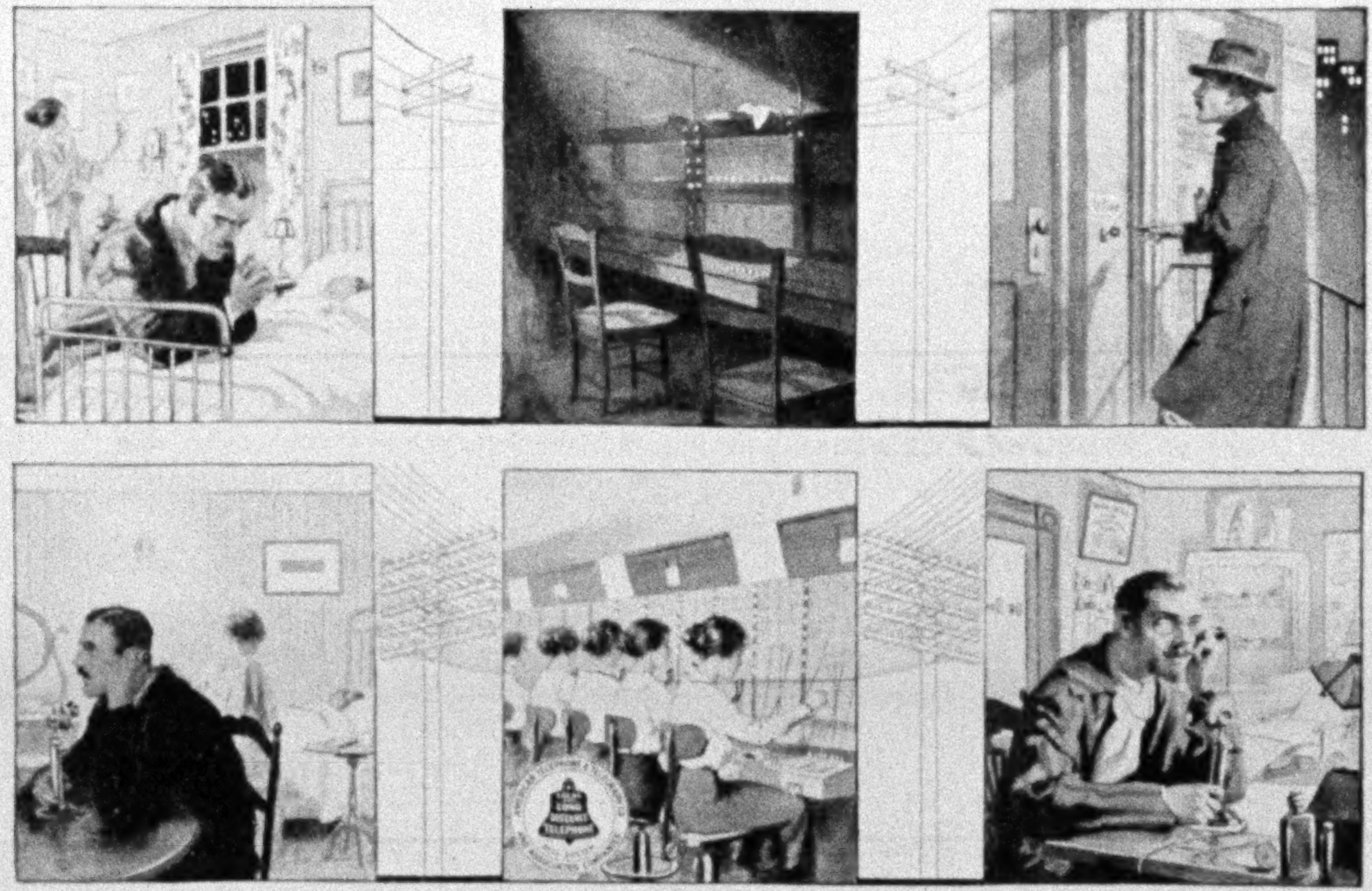


Best and Cheapest Service in the World

Here are some comparisons of telephone conditions
in Europe and the United States just before the war.

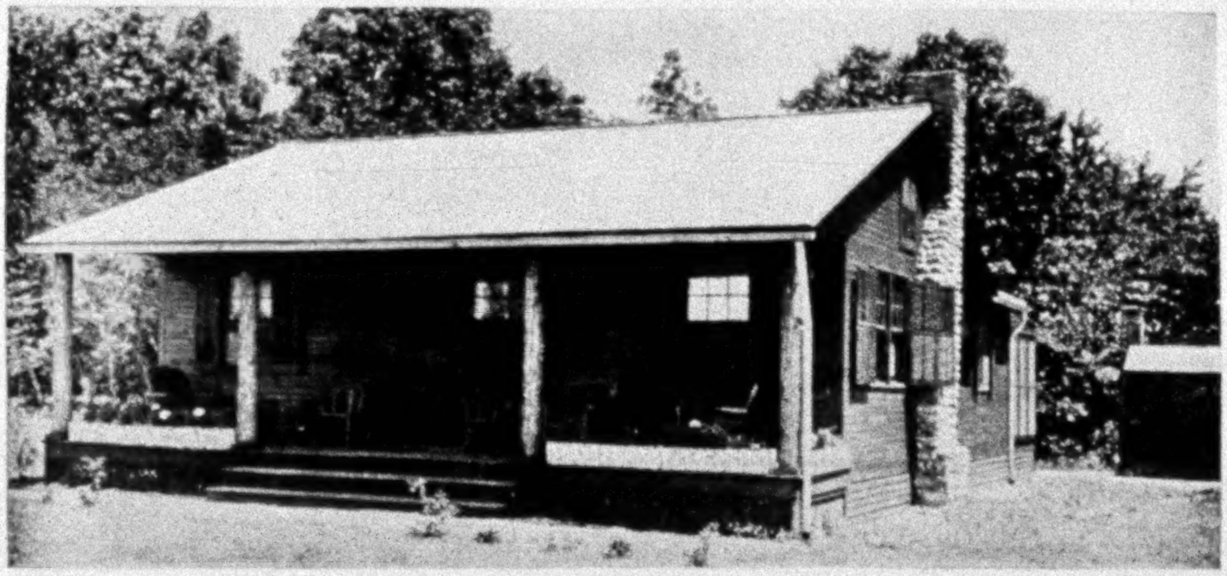
Here we have:	***In Europe:***
Continuous service in practically all exchanges, so that the telephone is available day and night.	Nine-tenths of the exchanges are closed at night, and in many cases, at mealtime.
A telephone to one person in ten.	Not one person in a hundred has a telephone.
3,000,000 miles of interurban or long-distance wires.	Not one-eighth as many miles in proportion to population and territory.
Prompt connections, the speed of answer in principal cities averaging about 3½ seconds.	In the principal cities, it takes more than twice as long for the operator to answer.
Lines provided to give immediate toll and long-distance service.	No such provision made. Telephone users are expected to await their turn.

As to cost, long-distance service such as we have here was not to be had in Europe, even before the war, at any price. And exchange service in Europe, despite its inferior quality, cost more in actual money than here.

Bell Service is the criterion for all the world, and the Bell organization is the most economical as well as the most efficient servant of the people.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

One Policy *One System* *Universal Service*



Wherever You Go

BY the side of your favorite trout stream—at the shores of a mountain lake, you can have this sturdy, comfortable building put up easily and quickly by unskilled labor. Built by the **BOSSERT** unit system—with air chamber sections—fully finished at the factory. Contains 12 x 15 living room, dining room, kitchen, three bed-rooms, and bath.

Send 12 cents today for catalog showing many attractive designs and details of Bossert permanent construction.

LOUIS BOSSERT & SONS, Inc., 1313 Grand Street, Brooklyn, N. Y.

BUILDERS OF BUNGALOWS FOR 25 YEARS

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WESTINGHOUSE ELECTRIC

The Long Arm of Westinghouse Service

No matter where in the United States they may be, owners of Westinghouse-Equipped motor cars are always in the zone of Westinghouse Service.

For Westinghouse Service follows the car from coast to coast and from the Red River to the Rio Grande. Its long arm reaches into every State.

Westinghouse Service Stations are maintained in 90 cities, and if the car-owner is not in immediate reach of a service station, he can get the attention his equipment requires by communicating with the nearest one.

Every Westinghouse Service man, moreover, has been trained in the Westinghouse plant or by Westinghouse experts so that he can give advice and assistance based on thorough knowledge of the equipment.

WESTINGHOUSE ELECTRIC & MFG. CO.
Automobile Equipment Department
SHADYSIDE WORKS, PITTSBURGH, PA.

Westinghouse

STARTING, LIGHTING & IGNITION EQUIPMENT

From Napkins Plus to Napkins Minus

HE HAD an overshipment of 400,000 paper napkins to dispose of or return to the mill. Which course should he take?

Beside his desk was a Multigraph Junior—and he knew its possibilities.

A letter was written, Multigraphed, and eighty copies were mailed to institutions—sanatoriums and the like.

The postage was a dollar sixty. Other costs—a few hours time for setting up, running and distributing the type; envelopes and letter-heads. Four dollars—three and three-quarter cents apiece—would cover the total cost and leave enough for the movies.

Result—one week later—the 400,000 napkins sold—additional orders for 80,000 more—side orders for $60.80 for other goods—and four new accounts opened. The napkin business was $446.40. The total business, $507.20. Sales cost, seven-tenths of one per cent.

Will M. Ross, Statesan, Wisconsin, is the man who accomplished this result.

Will is a good salesman. This performance proves that. The Multigraph Junior is a good sales assistant. This performance proves that. Put a good salesman and the Multigraph together and the combination will sell paper napkins, automobiles, life insurance, or anything else—merchandise or service.

If you haven't looked into your sales possibilities—as they are widened with the Multigraph—Senior or Junior—maybe this little account from the experience of just one user may prompt you to investigate.

The coupon won't start you in the napkin business, but it may be the means of changing some of your sales minuses to pluses. Clip—sign—mail.

THE MULTIGRAPH

Produces real printing and form-typewriting, rapidly, economically, privately, in your own establishment

Multigraph Junior—An efficient hand-operated machine for high-grade form typewriting and simple office printing. Price, complete, $200.00. Easy payments.

You can't buy a Multigraph unless you need it.

The Multigraph, 1821 East 40th Street, Cleveland, Ohio

Tell me more about using the Multigraph in sales work.

Name ____________________

Official Position ____________________

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Street Address ____________________

Town ____________ State ________

I am interested particularly in ____________________

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Burpee's Seeds Grow

Burpee's Annual 1917
Seeds that grow
W. Atlee Burpee & Co.

BURPEE'S SEEDS are grown not only to sell but to grow again.

The fact that 1916, our fortieth anniversary, proved to be our banner year, shows that confidence in the House of Burpee continues to grow.

Each packet contains the result of our forty years of extensive operation and intensive investigation.

Burpee's Annual for 1917

The Leading American Seed Catalog

is brighter, better and bigger than ever before. We have added twenty-two pages, making in all 204 pages, and best of all, you will find thirty Burpee Specialties illustrated in color. Burpee's Annual is mailed free upon request. A post card will bring it. Write for your copy today and mention this publication.

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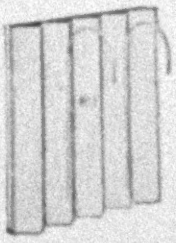
SĀVŌ AIR MOISTENER

Fill with water, hang on back of any radiator out of sight

Converts dry indoor air into a moist, wholesome, healthful atmosphere.



IT WILL SAVE

Your Health.
Furniture from shrinking.
Piano from warping.
Paintings from cracking.
Wall Paper from peeling.
Book Bindings breaking.
House Plants from dying.
Whole family from colds.

Three Sizes—$2.00, $1.75, and $1.00.
Write for Free Booklet.

SĀVŌ Manufacturing Company
315 New York Life Building Chicago, Illinois

Dreer's 1917 Garden Book

Dreer's Garden Book 1917

contains 288 pages, four color and four duotone plates, besides numberless photographic true-to-life reproductions. It lists all the standard varieties of flowers and vegetables, as well as the best of the season's novelties.

The newest Roses, the best Dahlias, and Dreer's Improved Hardy Perennials are given special prominence.

Mailed free to any one mentioning this Magazine.

HENRY A. DREER 714-16 Chestnut St. Philadelphia, Pa.

In spite of the great rise in the cost of raw materials, there has been no change in the quality of the ingredients entering into the composition of

SPRATT'S
Dog Cakes and Puppy Biscuits

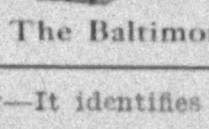
Remember that a dog fed on SPRATT'S is always a credit to his master.

Send stamp for catalogue.

SPRATT'S PATENT, LIMITED
NEWARK, N. J.

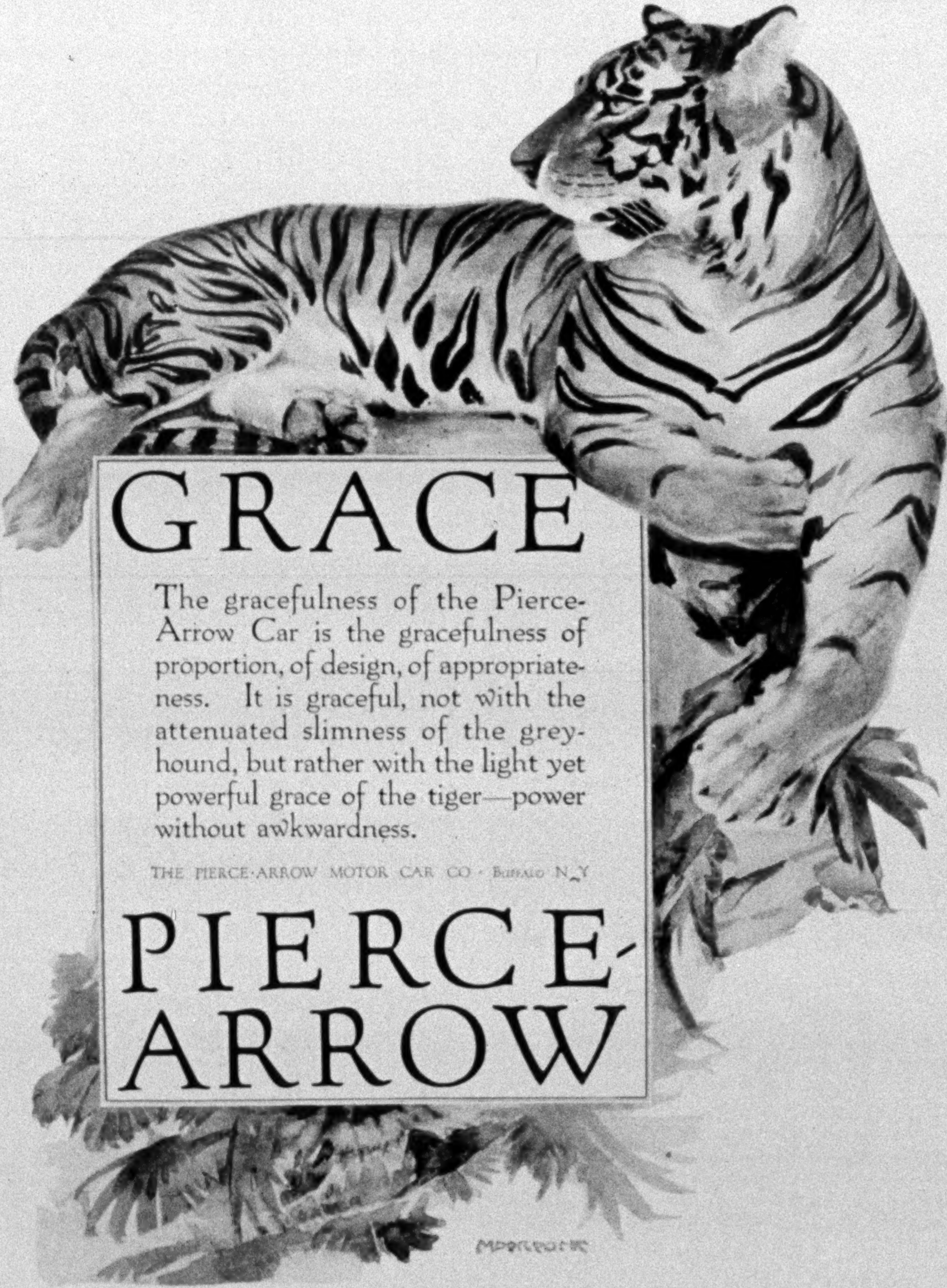
Water-Works Systems

Put your water-supply problems up to our engineering department. Let us work out the most effective and economical system that will meet your requirements.



We have filled over 15,000 orders for tanks, towers, and water-supply systems of every kind—from our pneumatic simplex system, furnished complete as low as $42 for country homes, to plants such as are required by country estates, railroads, municipalities, or factories. State your needs and ask for special circular No. 115.

The Baltimore Co., Balto., Md.



GRACE

The gracefulness of the Pierce-Arrow Car is the gracefulness of proportion, of design, of appropriateness. It is graceful, not with the attenuated slimness of the greyhound, but rather with the light yet powerful grace of the tiger—power without awkwardness.

THE PIERCE-ARROW MOTOR CAR CO · Buffalo N.Y

PIERCE-ARROW

3 Prime Reasons for—

The Supremacy of
BISSELL'S
Vacuum Sweeper

First, the carpet-sweeper element, embodying the merit of all Bissell sweepers.

Second, *adequate suction* produced by *three* powerful bellows pumps.

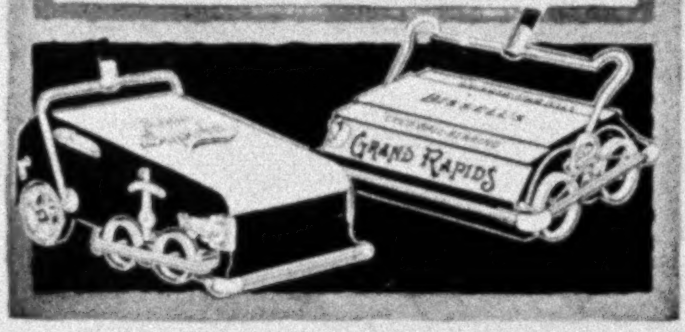
Third, the *mechanically correct* and clever *union* of brush action and suction plus real workmanship. The soft bristle brush gently agitates the nap of rugs and carpets, sweeping the coarser substances into the litter-pan and leaving the finedust in perfect condition to be pumped up through the suction nozzle.

Used regularly, Bissell's Vacuum Sweeper *keeps* rugs and carpets thoroughly clean in a sanitary manner, preventing the accumulation of dirt which necessitates drastic cleaning methods.

Bissell's Carpet Sweeper is the greatest household convenience ever invented, the device that has saved *millions* of women from the drudgery of sweeping. Except for kitchen or porch, discard your broom and use a Bissell's for little sweeping jobs that must be done two or three times daily. It makes housework easy.

Vacuum Sweepers, $7.50 and $9. "Cyco" Ball-Bearing Carpet Sweepers, $3 to $5.50. A trifle more in the West, South, and Canada. Booklet on request.

BISSELL CARPET SWEEPER CO.
Oldest and Largest Exclusive Manufacturers
of Carpet Sweeping Devices in the World
Dept. 313, GRAND RAPIDS, MICHIGAN
Made in Canada, too (314)



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Fascinating new tour, far from the beaten track, to the wonderlands of the great South Pacific, including Hawaii, Samoa, Fiji, New Zealand, Australia, Tasmania, Rarotonga, and Tahiti.

Leaving San Francisco March 7 and March 13.

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Delightful tours of this wonderful continent leave Feb. 10, 24 and Mar. 14. Small parties. Leisurely travel. Experienced tour Managers.

Also Tours to California and Hawaii, Japan and China, and Cruises to the West Indies.

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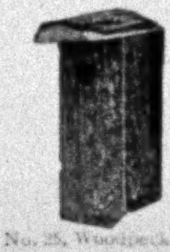

No. 25, Woodpecker

No. 21, Bluebird

"America First" is all right, but Conservation of Bird Life should come a close second. Make a start by sending $1.25 for one or $3.50 for the three Rustic Cedar Bird Houses.

Booklet, "Bird Architecture," free with every order.

Crescent Company, Toms River, N. J.

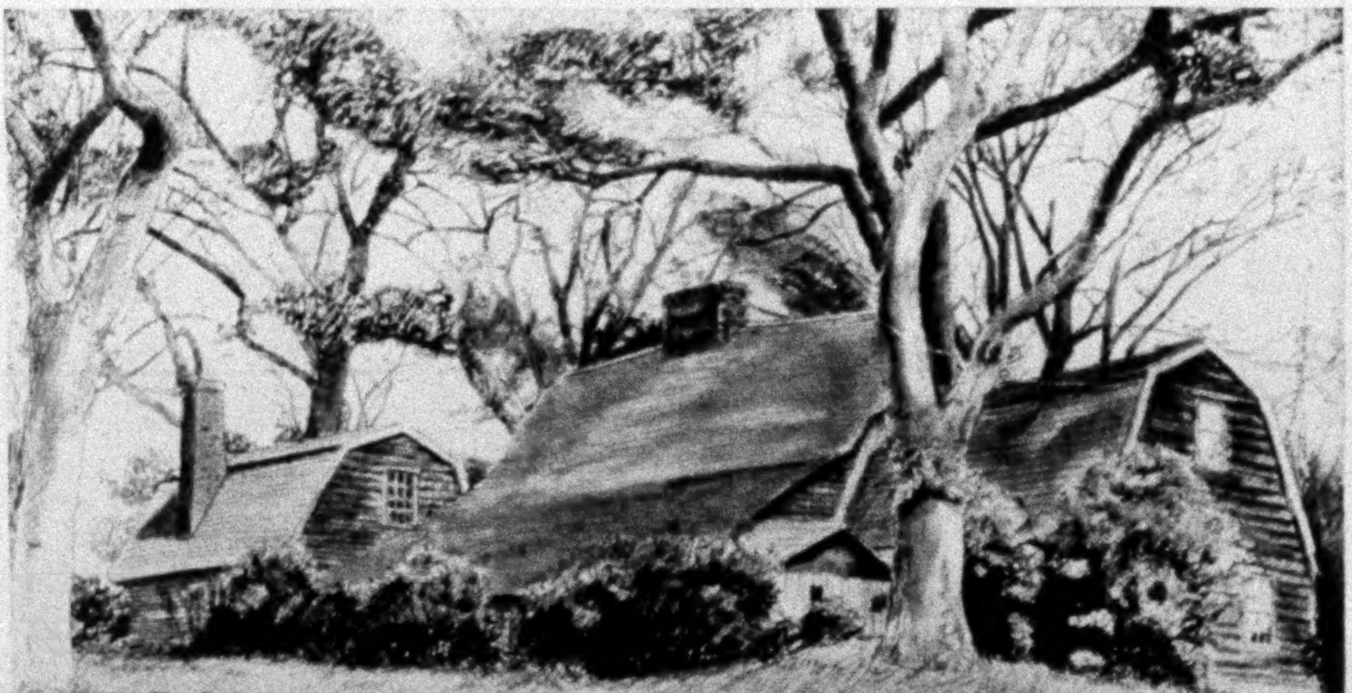
JUDD & DETWEILER, Inc.
Master Printers
420-422 Eleventh Street N.W.
WASHINGTON, D. C.

The 1917 Woodlawn Catalogue is filled with beautiful garden scenes and handsome illustrations of the flowers themselves. It lists a large variety of plants, shrubs, roses, fruit and ornamental trees. You will appreciate a free copy. Send for it today.

Woodlawn Nurseries **Allen L. Wood, Prop.**
918 Garson Avenue, Rochester, N. Y.

What 15 cts. Will Bring You From the Nation's Capital

The little matter of **15c** in stamps or coin will bring you the Pathfinder for **13** weeks on trial. The Pathfinder is an illustrated weekly, published **at the Nation's Center,** for the Nation; a paper that prints all the news of the world and that tells the truth and only the truth; now in its 23d year. This paper fills the bill without emptying the purse; it costs but $1 a year. If you want to keep posted on what is going on in the world, at the least expense of time or money, this is your means. If you want a paper in your home which is sincere, reliable, entertaining, wholesome, the Pathfinder is yours. If you would appreciate a paper which puts everything clearly, fairly, briefly—here it is. Send **15c** to show that you might like such a paper, and we will send the Pathfinder on probation **13** weeks. The 15c does not repay us, but we are glad to invest in New Friends. **THE PATHFINDER PUBLISHING CO., Box 33, WASHINGTON, D. C.**



The Fairbanks House at Dedham, Mass. Built in 1636. Excepting the shell and adobe houses of Florida and California, the oldest house now standing in America.

281 Years Old—and Still a Comfortable Home

For nearly three centuries this unpainted house has stood exposed to the weather. Continuously occupied and still almost perfectly preserved, it offers convincing proof of the enduring qualities of

WHITE PINE

Ever since the Pilgrims landed, White Pine has been universally recognized as the wood preferred above all others in home-building. And figuring value in terms of service, it is the most *economical.*

White Pine does not shrink, swell, crack, twist, warp or rot; and once in place it "stays put," after years of exposure, even in the closest fitting mitres and in delicate mouldings and carvings. It takes paints and stains perfectly.

Investigation of the merits of White Pine will well repay anyone seeking a wise choice of building materials.

Send today for our free booklet, "WHITE PINE IN HOME-BUILDING." It is beautifully illustrated and full of valuable information and suggestions on home-building. If there are children in your home, send also for "The Helen Speer Book of Children's White Pine Toys and Furniture," a fascinating plan book, from which a child may build its own toys and toy furniture.

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Representing
The Northern Pine Manufacturers'
Association of Minnesota, Wisconsin
and Michigan, and The Associated
White Pine Manufacturers of Idaho

NEW-YORK LIFE

INSURANCE COMPANY

346 AND 348 BROADWAY . . NEW YORK CITY

TO THE POLICY-HOLDERS AND THE PUBLIC:

A brief of the chief activities of this Company during 1916 runs as follows:

New Paid Business	**$263,048,300.00**
Of this total $239,090,873 was secured in the United States.	
Total Income	**$138,559,395.79**
Total Payments to Policy-holders . .	**$81,415,138.36**
Of this total $19,551,361 was paid in dividends.	
Invested During the Year in Bonds and Mortgage Loans,	**$70,717,602.17**
To pay 5.26%	
Added to Legal Reserves	$24,676,393.00
Market Value of Assets, Dec. 31, 1916	$866,988,841.57
Legal Liabilities	$728,226,426.34
Reserved for Dividends and Contingencies	$138,762,415.23
Outstanding Insurance	$2,511,607,274.00
Represented by 1,228,601 policies.	

The actual mortality of the Company, expressed in the per cent which it bears to the expected death losses according to the tables of mortality adopted by the State for valuation purposes through a period of years, is as follows:

1912 Actual death losses 76% of the "expected"
1913 Actual death losses 73% of the "expected"
1914 Actual death losses 73% of the "expected" (5 mos. of war)
1915 Actual death losses 73% of the "expected" (12 mos. of war)
1916 Actual death losses 71% of the "expected" (12 mos. of war)

Significant Facts:

Mortality Rate reduced; Expense Rate reduced; Interest Rate increased; New Business increased.

The Seventy-second Annual Statement of the Company will be filed at once with the Department of Commerce in Washington and with each State of the United States and each country where we do business. A brief of that statement will be sent gratis to any person asking for it.

DARWIN P. KINGSLEY,
President.

INDIANA

LIMESTONE

The ARISTOCRAT *of* BUILDING MATERIALS

Within your reach? YES!

The very same stone that has been used for many years in the finest buildings, both public and private, in every State in the Union—a natural stone so remarkable that if you are about to build or interested in building, you should ***certainly*** know ***all*** about it. The U. S. Government is one of the biggest users of this "Aristocrat of Building Materials." Yet it is even more reasonable in price than artificial materials.

You are familiar with buildings built of Indiana Limestone, but probably do not know it by name. Most likely it has never occurred to you that this beautiful material is quarried in such quantities that the price is within your easy reach.

You ***do*** know that nothing in the world gives the impression of dignity, costliness, refinement and beauty like ***natural*** stone, the genuine handiwork of nature, and we want you to know about Indiana Limestone, "The Aristocrat of Building Materials," to hold a piece in your hand, and to decide for yourself about the new building. (See FREE OFFER below.)

Home?

YES—Indiana Limestone is a badge of distinguished taste as shown by hundreds of the finest houses, great and small.

Apartment?

YES—Whether for the whole or for trimming Indiana Limestone denotes the "class" that pays cash on your rent roll.

FOR ANY BUILDING YOU EXPECT TO LIVE IN, TO LOOK UP TO, OR LOVE—INDIANA LIMESTONE—NOTHING SURPASSES IT.

Church?

YES—Nothing better expresses the high function of the church edifice than Indiana Limestone the product of Nature's wonder-processes.

Commercial Building?

YES—You may pattern by the Grand Central Terminal (N. Y.) and hundreds of fine buildings from skyscrapers to smart little stores.

YOUR BOY WILL BE INTERESTED IN THE WONDERFUL FOSSIL SHELL FORMATION OF INDIANA LIMESTONE AS TOLD IN OUR BOOK.

FREE **Handsome paperweight of Indiana Limestone showing several finishes, with a handsomely illustrated interesting book.**

Send for them today.

INDIANA LIMESTONE QUARRYMEN'S ASS'N, BOX 216, BEDFORD, IND.

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HESS-IVES COLOR PHOTOGRAPHY

IF you thoroughly understood how inexpensive and easy it now is to take color photographs without the need of a special camera, but with any camera you already have, you and every traveler, scientist, professional and amateur photographer would specialize in color photography at once.

The Hiblock

a pack of two sensitized blue and red plates with a green film interposed, bound together as one, which fits into any camera in a special holder which we furnish, makes this possible. One exposure is all that is necessary. And you use *your own camera.* Send for booklet.

HESS-IVES CORPORATION
1201 Race Street **Philadelphia**

The Manor
Albemarle Park
ASHEVILLE, N. C.

A charming English Inn set in a blossoming park on a hillside, 2500 feet elevation. Offers real Southern hospitality, clear, dry, life-giving atmosphere of the "Land of the Sky." Unusual facilities for all outdoor sports and pastimes the year round. PERFECT GOLF IN A PERFECT CLIMATE—*18 holes—turf greens.* Write for booklet.

Use This Chest FREE

Moth-Proof Cedar Chest

Sent on FREE TRIAL

Famous Piedmont Red Cedar Chest. Your choice of 90 styles and designs. Direct from factory to home on 15 days' free trial. We pay the freight. **A Piedmont protects furs, woolens, and plumes from moths, mice, dust, and damp.** Distinctly beautiful. Needed in every home. Lasts for generations. Finest wedding or birthday gift at great saving. **Write today for our great new catalog and reduced prices—all prepaid free to you.**

Reduced Factory Prices Freight Prepaid

Piedmont Red Cedar Chest Co., Dept. 36, **Statesville, N. C.**

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in the

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The Membership Fee Includes Subscription to the National Geographic Magazine

DUES: Annual membership in U. S., $2.00; annual membership abroad, $3.00; Canada, $2.50; life membership, $50. Please make remittances payable to National Geographic Society, and if at a distance remit by N. Y. draft, postal or express order.

Please detach and fill in blank below and send to the Secretary

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To the Secretary, National Geographic Society,
Sixteenth and M Streets Northwest,
Washington, D. C.:

I nominate ____________________

Address ____________________

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for membership in the Society.

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3-17 (Write your address)

Saves **On His Coal Bill** **Half**

Same big Saving guaranteed to you!

Nine rooms heated with an UNDERFEED at one-half the former cost. Not a mere haphazard saving, but a guaranteed saving—a saving that you, too, can enjoy. Read the letter:

"The UNDERFEED is heating nine rooms and gives very successful results with about ten tons of soft coal per season. You can always rely on my putting in a good word for the UNDERFEED, as it is saving me at least 50 per cent in my fuel bill each season."
(Signed) HERMAN W. KOCH, 723 Chestnut St., Burlington, Wis.

WILLIAMSON NEW-FEED UNDERFEED Furnaces and Boilers **CUT COAL BILLS ½ to ⅔**

The burning principle of the UNDERFEED is that of a candle held right end up. The fuel supply is always below the clean, efficient flame. Fire is never smothered or chilled. Smoke, soot and gas—all valuable heat elements—are consumed as they pass up through the flame.

Because of this scientific principle, the UNDERFEED burns the cheaper grades of coal cleanly and effectively—to a white ash—no clinkers or partly burned coals. Clean, uniform, ample heat throughout the house.

Helpful Book Free

It is called "From Overfed to UNDERFEED." Pictures and describes it all. Explains how easily operated by a boy.

Whether you heat with warm air, hot water, steam or vapor, this free book will save you money—for coal cost is actually reduced ½ to ⅔, guaranteed with the UNDERFEED. Send coupon for it today—NOW.

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Tell me how to cut my coal bills from ½ to ⅔ with a Williamson Underfeed.
Warm Air ....Steam or Hot Water
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Heating Contractors: Let us tell you about the Williamson UNDERFEED and our proposition. Both are winners.

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Twenty-six years devoted to originating and specializing in CHRYSANTHEMUMS speaks for itself.
Our products are known in every land where Chrysanthemums are grown.
You should have our CATALOGUE; it is authentic, fully illustrated, and includes all the best.

IT IS FREE ELMER D. SMITH & CO., Adrian, Mich. WRITE TODAY
The only firm in America growing Chrysanthemums exclusively.

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A Garden Full of Gladioli for $1.00

The Gladiolus is one of the most satisfactory flowers grown, because it blooms continuously when it is cut and put in water, just as well as when in the ground.

There is no reason why every family cannot enjoy this grand flower, for the simple reason that it is as easy to grow as the potato.

You can have them in bloom from July to frost if you plant a few bulbs each month from April to July.

For only **ONE DOLLAR** we will send **75 Bulbs** of our **Grand Prize** Mixture, which covers every conceivable shade in the Gladiolus kingdom.

Last year we sold thousands of these bulbs and have received numerous testimonials as to their merits.

ORDER YOUR BULBS NOW, so as to have them to plant when you begin making your garden.

Simple cultural directions with every package.

Write today, mention "National Geographic Magazine," and secure this splendid collection of Gladiolus bulbs for **only $1.00**, prepaid to your home anywhere in the United States, with our **1917 Spring Catalogue.**

Stumpp & Walter Co.

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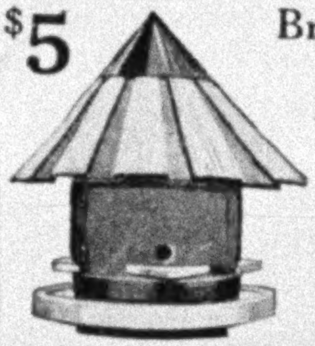

$5 For This 4-Room Blue-Bird House

Solid Oak, Cypress Shingles, Copper Coping. Blue birds raise 2 or 3 broods a year—but never in the same nest. They move from room to room in this 4-room Dodson House. [10]

Bring the Blue-Birds
—for Happiness!

A Dodson House, built by the "man the birds love," will bring a family of these "happiness" birds to live in your yard. Mr. Dodson has spent 22 years learning how to build houses that the *birds like*. Bird Lodge, his beautiful home, is thronged with native birds. Wrens, blue-birds, martins, each must have a special style house. Prices range from $1.50 to $12. Buy now and let your houses "weather." The birds like them better.

Bird Book Free—Send for Mr. Dodson's book which tells how to win bird friends to your garden. Describes houses, birds, baths, winter feeding devices, with prices. All are patented. Sent free with a beautiful bird picture in colors, worthy of framing. Write to

JOSEPH H. DODSON, of Bird Lodge
Director, American Audubon Society
702 Harrison Ave. Kankakee, Ill.

Grow Your Own Fruit

You can have apples, pears, cherries, peaches, grapes in your own yard. Don't *buy* them when you can *grow* them. Send today for our

New Fruit Tree Book

which tells *how* you can have fruits, flowers, vegetables, and *what* varieties we consider best. For 63 years we have sold the highest quality stock direct to the planter—we have no agents. Write today for catalogue.

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This course was prepared especially for home training. What if you did not get a high school education? You can make up for lost time now. Idle evenings can be spent in pleasant reading that will give you a thorough high school training.

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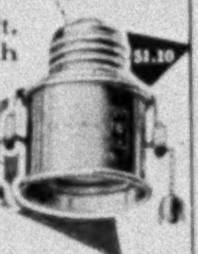
The **DIM-A-LITE** gives you soft, electric twilight. Fine for bath room, sick room, nursery, hall. Turns electric lights up and down like gas.



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DIM-A-LITE Attachment Fits any Socket and Lamp $1.10
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Ask any dealer, or by mail, postpaid. Write for "Facts on Saving of Current."

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SO MANY REQUESTS are being constantly received regarding lantern slides from the copyright photographs in the GEOGRAPHIC that arrangements have been completed to supply them to members of the Society. Slides are not kept in stock, each order being made up as received, and will be delivered within two weeks after receipt of order, unless otherwise advised.

The copyright notice must appear on each slide. The purchase of lantern slides does not carry with it the authority to publish the pictures and they cannot be used for advertising purposes.

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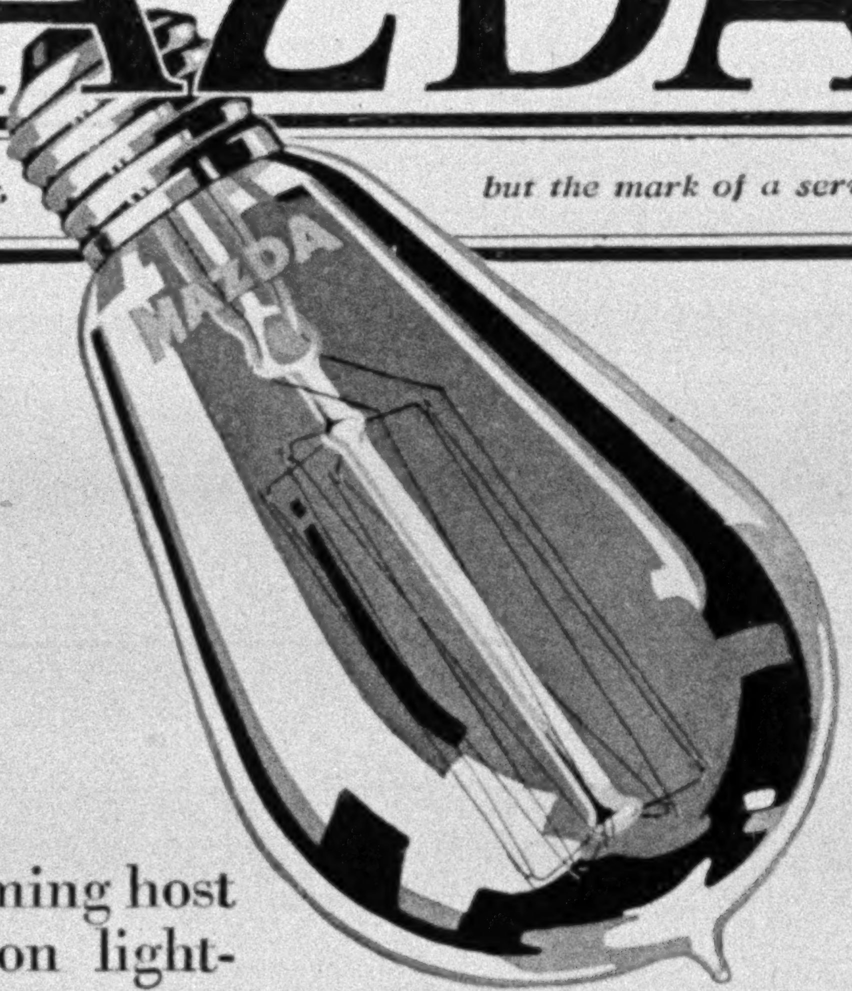
"Not the name of a thing, but the mark of a service"



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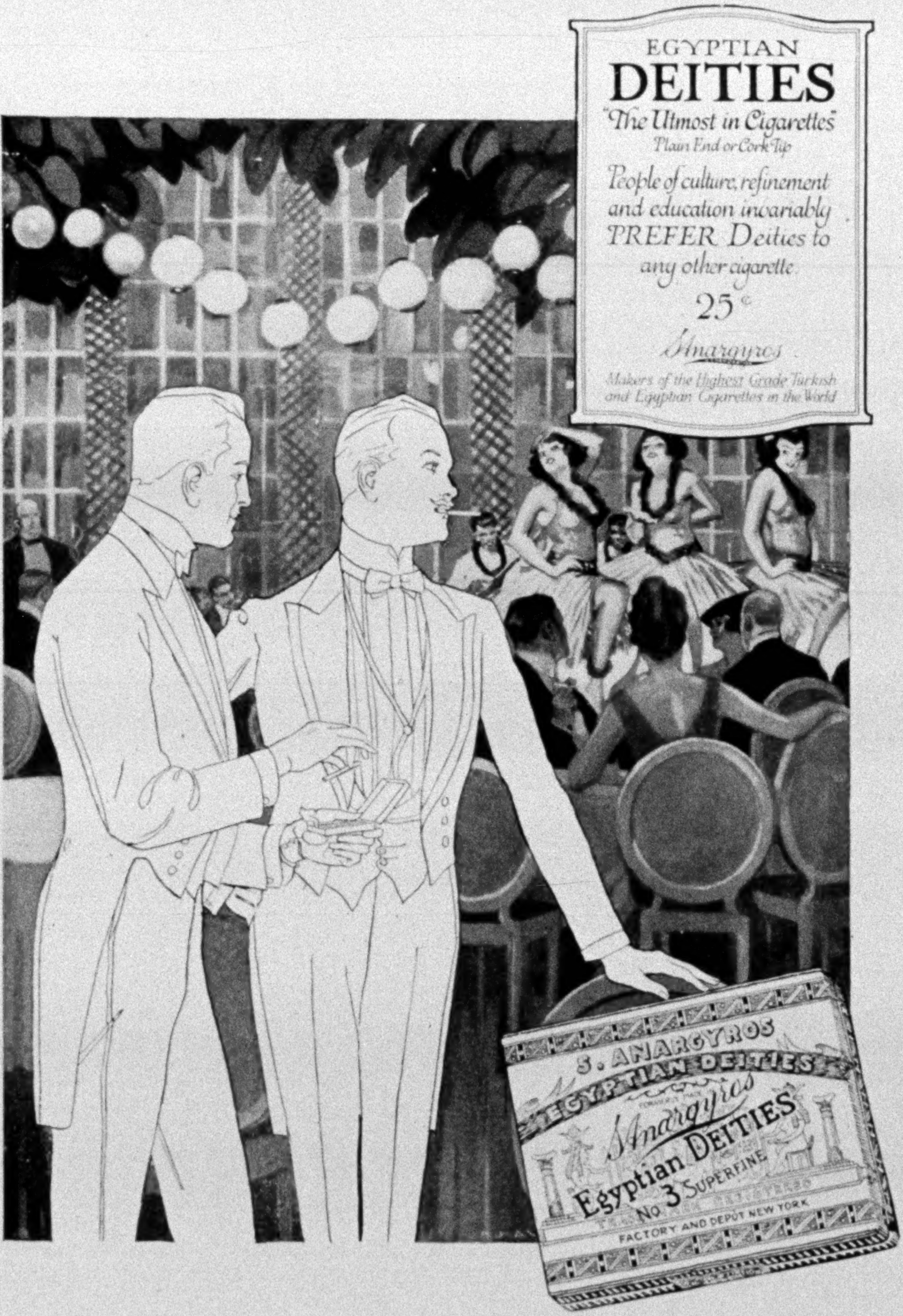

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Plain End or Cork Tip

People of culture, refinement and education invariably PREFER Deities to any other cigarette.

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Makers of the Highest Grade Turkish and Egyptian Cigarettes in the World

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50
American Bankers
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All Aboard the Magic Carpet

The magic carpet, famed in Arabian Nights, carried its fortunate owner safely and conveniently wherever his heart desired.

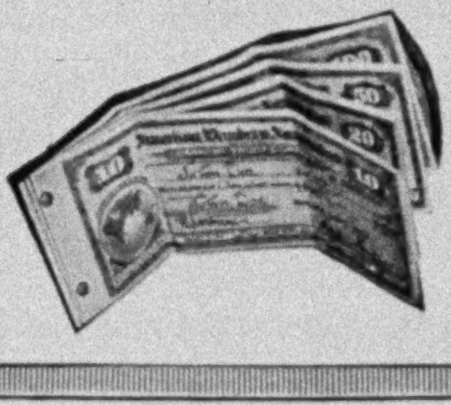
"A. B. A." Cheques have been likened to a "modern magic carpet" because they are the form of funds on which the modern tourist can safely and conveniently travel all over the globe.

The ***safety*** of "A. B. A." Cheques lies chiefly in their not being usable until the owner countersigns them, and in the possibility of replacing them in case of loss.

"A.B.A." American Bankers Association Cheques

Their ***convenience*** is manifold. An "A.B.A." Cheque does not need to be cashed; in a very real sense it ***is*** cash, both domestic and foreign, because it is accepted just as if it were the actual currency of whatever country the traveler happens to be in.

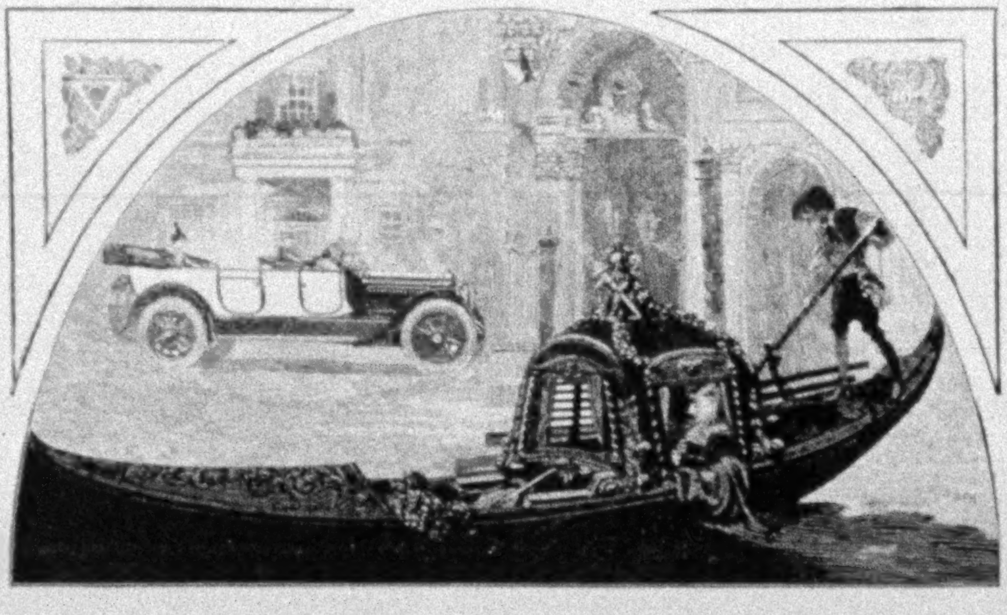
When you are in America your "A. B. A." Cheque spells dollars; when in Russia it spells rubles; in Italy, lire; in France, francs; in Germany, marks; in Great Britain and her Colonies, pounds and shillings, and so on.



You pay for your tickets and hotel service in San Francisco, or New York, or Paris, or in some remote little town, with "A.B.A." Cheques; you pay for ivories in Pekin, for teahouse refreshments in Tokyo, for laces in Venice, for rugs in Tabriz; for most anything, most anywhere—with "A. B. A." Cheques.

You can obtain "A. B. A." Cheques in denominations of $10, $20, $50, and $100 at almost any bank.

Write to Bankers Trust Company, New York, for information as to where in your vicinity you can obtain these cheques.



Afloat! Every roadway a Grand Canal —smooth and buoyant—to be *enjoyed* in surpassing comfort and tranquil luxury

And with the *added element* of far-reaching speed—rangeability such as the grand dames of Venice the magnificent never dreamed.

Smooth power!

A world's vision of luxurious freedom realized—*for you.*

Through all ages *refinement* has asserted itself by its superior modes of travel. But with the coming of the silent, supple and powerful Twin-six motor and the development of sumptuous Packard body-styles—that superiority has taken on an entirely new significance.

There's a new joy in automobile riding.

Yours—now! The delightful sensation of power afloat—which you yourself must experience to fully appreciate.

Ask the man who owns one

Twenty distinctive styles of Twin-sixes. Prices, open cars, $3050 and $3500, at Detroit. Packard branches in all important cities

Packard
TWIN-6

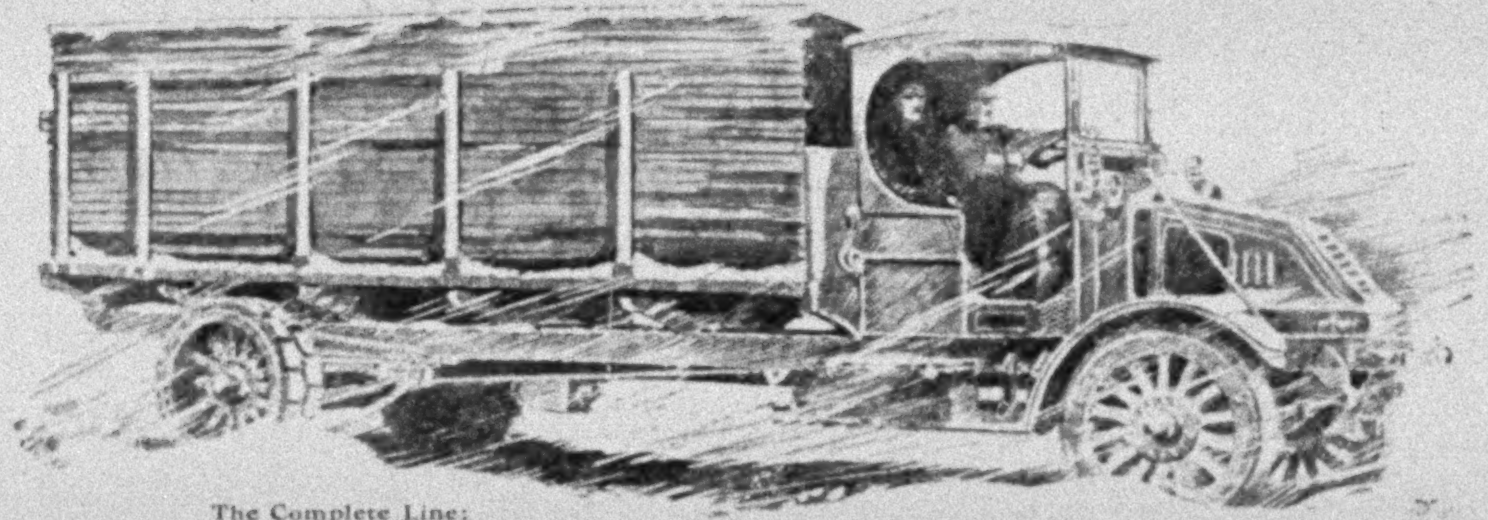
The Titan of Commerce

ANY and every condition of road and load has been adequately provided for in Kelly design and construction.

When the storms and drifts of winter make a call on the reserve power and sturdiness of a truck, Kellys are never found wanting. No Kelly ever "laid down."

Let us put you on the complimentary list of our monthly magazine—"Like Kelly Does." A bright, informative little publication about motor trucks. Of real value to anyone interested in trucking and its problems.

The Kelly-Springfield Motor Truck Co.
Springfield, Ohio



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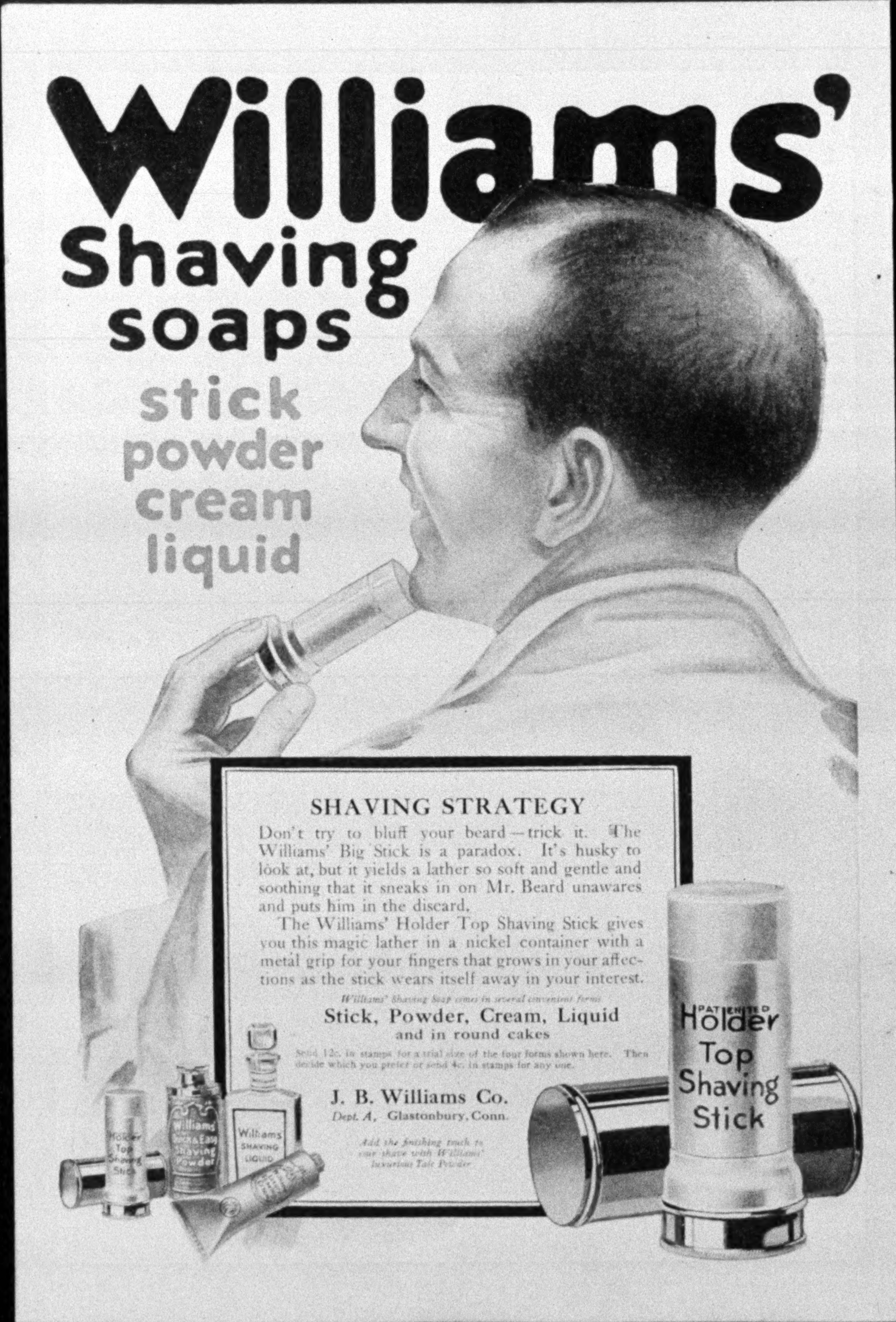
Worm Drive—1½ and 2½ tons.
Chain Drive—1½, 2½ 3½, 4,
5 and 6 tons.

KELLY TRUCKS

PRESS OF JUDD & DETWEILER INC.


Holder Top Shaving Stick
Williams Quick & Easy Shaving Powder
Williams Shaving Liquid
Patented Holder Top Shaving Stick

Williams'

Shaving soaps

stick
powder
cream
liquid

SHAVING STRATEGY

Don't try to bluff your beard—trick it. The Williams' Big Stick is a paradox. It's husky to look at, but it yields a lather so soft and gentle and soothing that it sneaks in on Mr. Beard unawares and puts him in the discard.

The Williams' Holder Top Shaving Stick gives you this magic lather in a nickel container with a metal grip for your fingers that grows in your affections as the stick wears itself away in your interest.

Williams' Shaving Soap comes in several convenient forms

Stick, Powder, Cream, Liquid
and in round cakes

Send 12c. in stamps for a trial size of the four forms shown here. Then decide which you prefer or send 4c. in stamps for any one.

J. B. Williams Co.
Dept. A, Glastonbury, Conn.

Add the finishing touch to your shave with Williams' luxurious Talc Powder